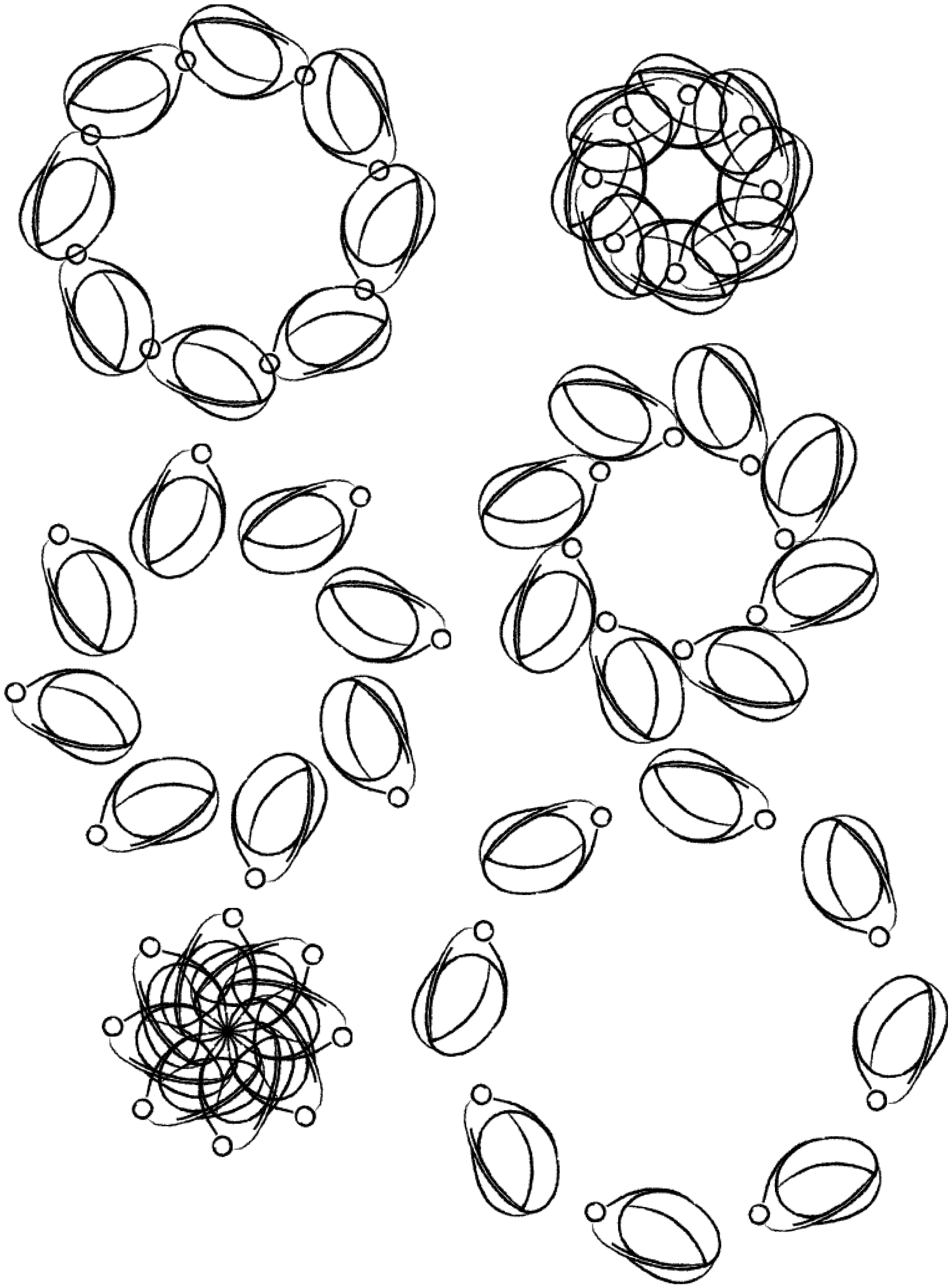
DP1 PORTFOLIO

BARC0131

ELISA MARTINI - SARA MOTWANI

SECTIONS:

ELSA PROJECT



ABSTRACT

Our feelings, thoughts and actions are all a crystallization of what is stored in the subconscious mind. Everything we see, do and experience on a day-to-day basis, whether consciously or not gets stored into the database of the subconscious. This information then tends to present itself in a physical form through our reactions to certain situations and experiences.

Through our structure we aim to emulate the cycle of the subconscious mind through an interactive and dynamic experience. This emulation is created through a combination of 3 key elements:

FORM

CHANGE

ACTION

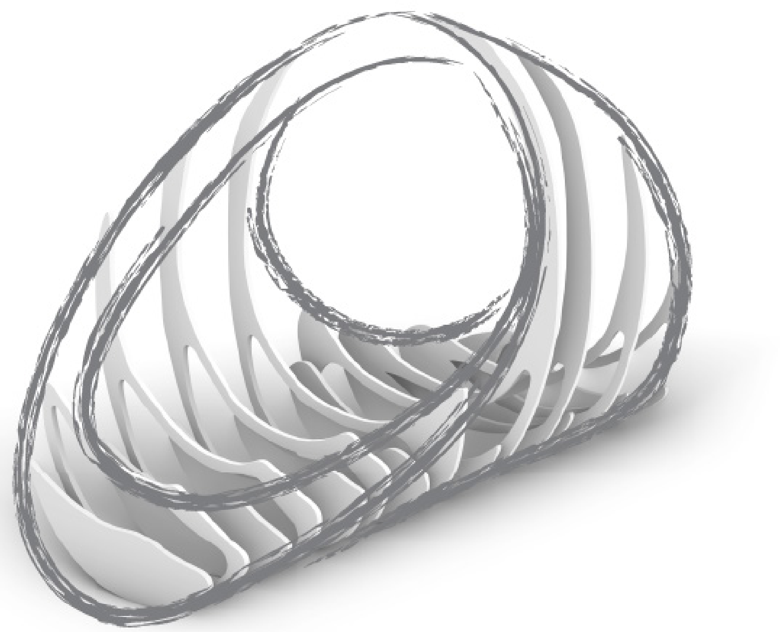
NARRATIVE
FORM

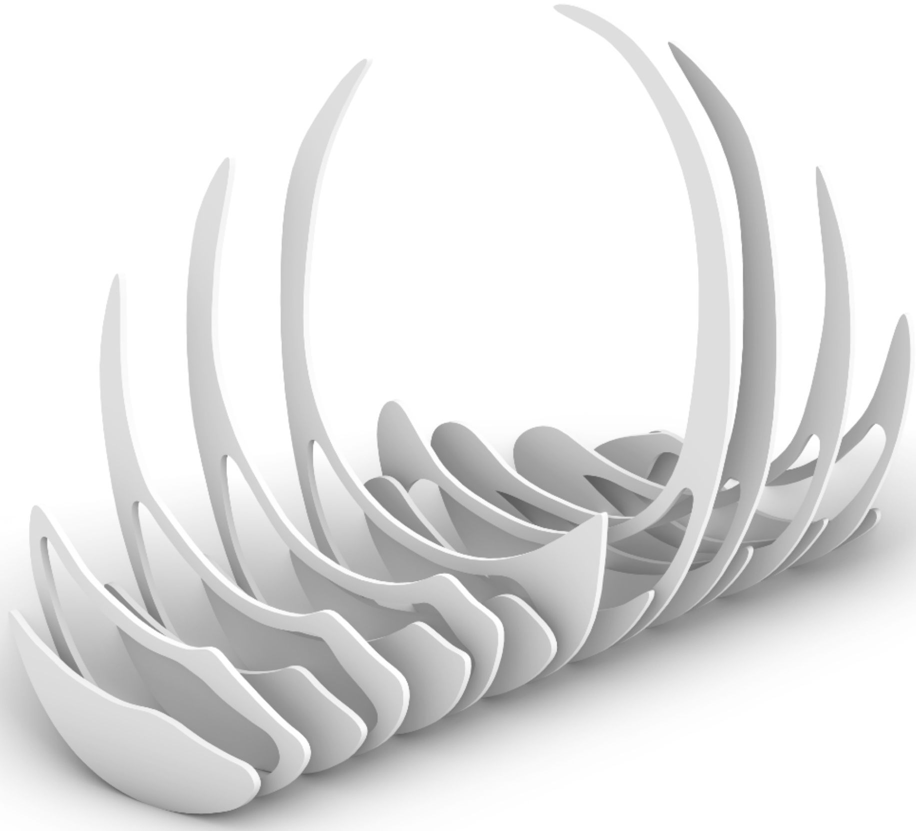
The structural form is inspired from a non-orientable mobius strip. The mobius strip has a rich figurative implication - when you try to move forward, you ring sideways, when you try to circle in, you find yourself outside. It's an apt allegory for losing control. This symbolically correlates to the lack of control one has when it comes to the subconscious mind.

Another metaphoric implication from the mobius strip is its continuous and cyclic form. This is emblematic of the subconscious follows a cycle of intake and release of information from the conscious to the subconscious. It also represents the selected natural parameter, condensation, by offering an ode to nature's water cycle.

The final form is an iteration of the traditional mobius strip. The strip is oriented so as to have an evident twist of the surface visible on top. The base of this strip is then morphed to be wider. This shape is then sliced into sections perpendicular to the ground. Finally the layers are turned into frames and offcuts.

This largely see-through form allows a spectator to see every bit of the functioning of the structure. This also, ironically, removes the element of mystery about the mobius and in a sense 'gives back control', the lack of which was spoken initially. The layered form also connects with the 'layers of the subconscious mind'. One of the main reasons for having this sense of transparency in the form was to ensure that the structure does not block the view of the forest.





SITE ANAYLSIS

SITE VISIT

CONDENSATION : More dew observed in areas closer to the pond

COLOUR PALETTE : The colours used in the portfolio were inspired from the forest

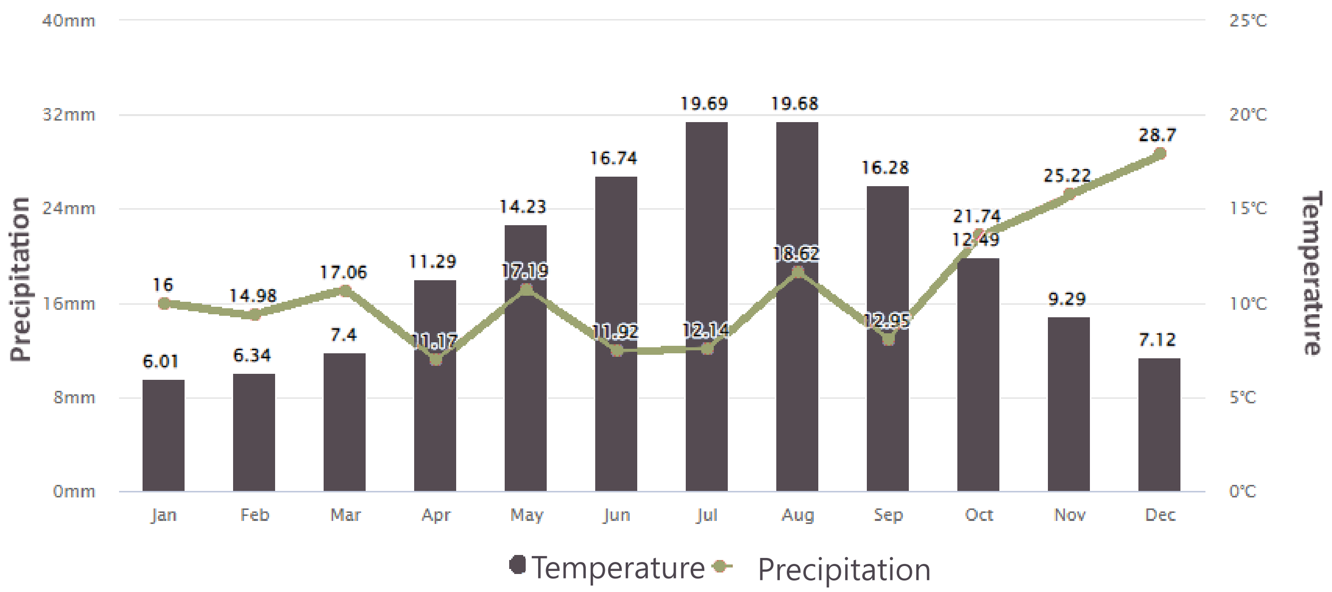
SOUNDS : The most characteristic feature of the visit was the sounds made by dry leaves and twigs while walking over them through the forest

SITE ANALYSIS
SITE CLIMATE CONTEXT

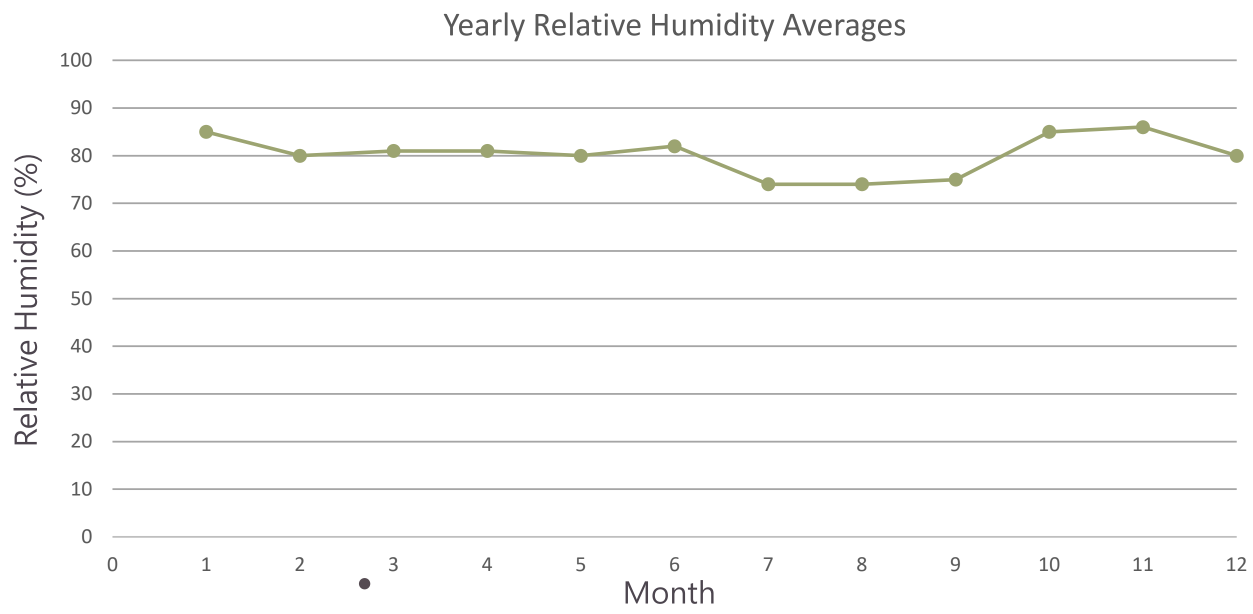
The site allocated for the Project is Flimwell, a sustainable woodland development located in East Sussex.

Research into the general weather showed that **highest humidity levels** conicide with times of **highest precipitation** and **low temperatures**.

Historical Temperatures of Flimwell
(adapted from tcktcktck.org)



Yearly Relative Humidity of Flimwell
(adapted from tcktcktck.org)

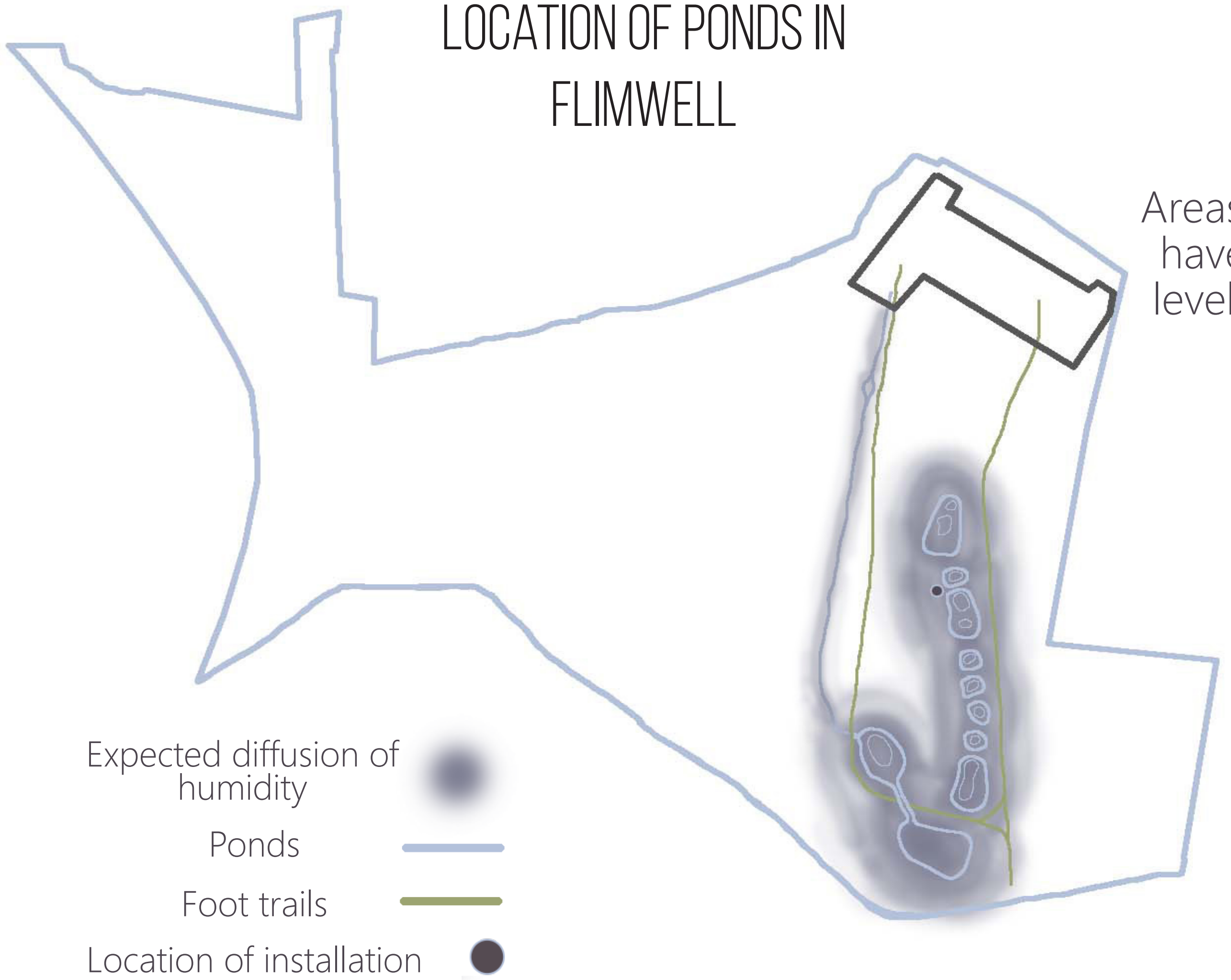


SITE ANALYSIS

SITE CLIMATE PARAMETERS

Condensation was the environmental parameter chosen to explore in this project. It was therefore important to **identify areas** of high humidity and what natural factors cause it.

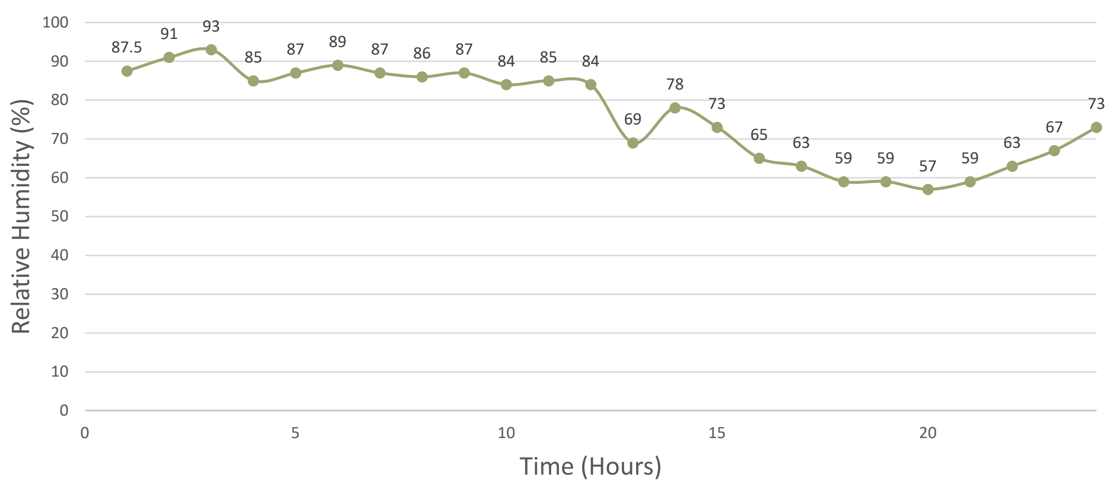
LOCATION OF PONDS IN FLIMWELL



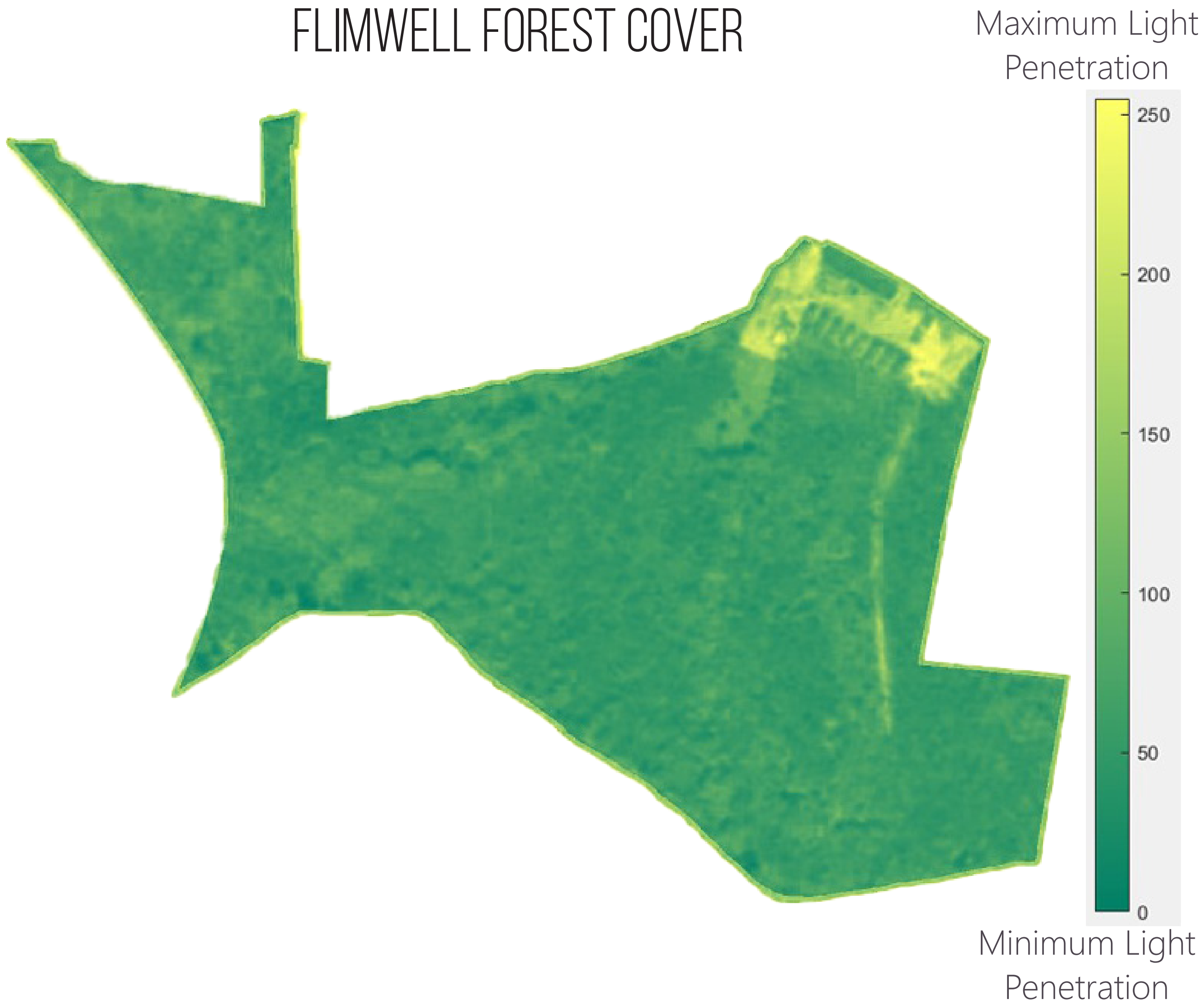
Areas around the ponds will have the highest humidity levels because of the open

Forest cover aids humidity levels by releasing water molecules through photosynthesis and retaining them thanks to the tree coverage. Tree-coverage also increases the temperature of the area by bouncing back a portion of the long-wave radiation emitted from the ground.

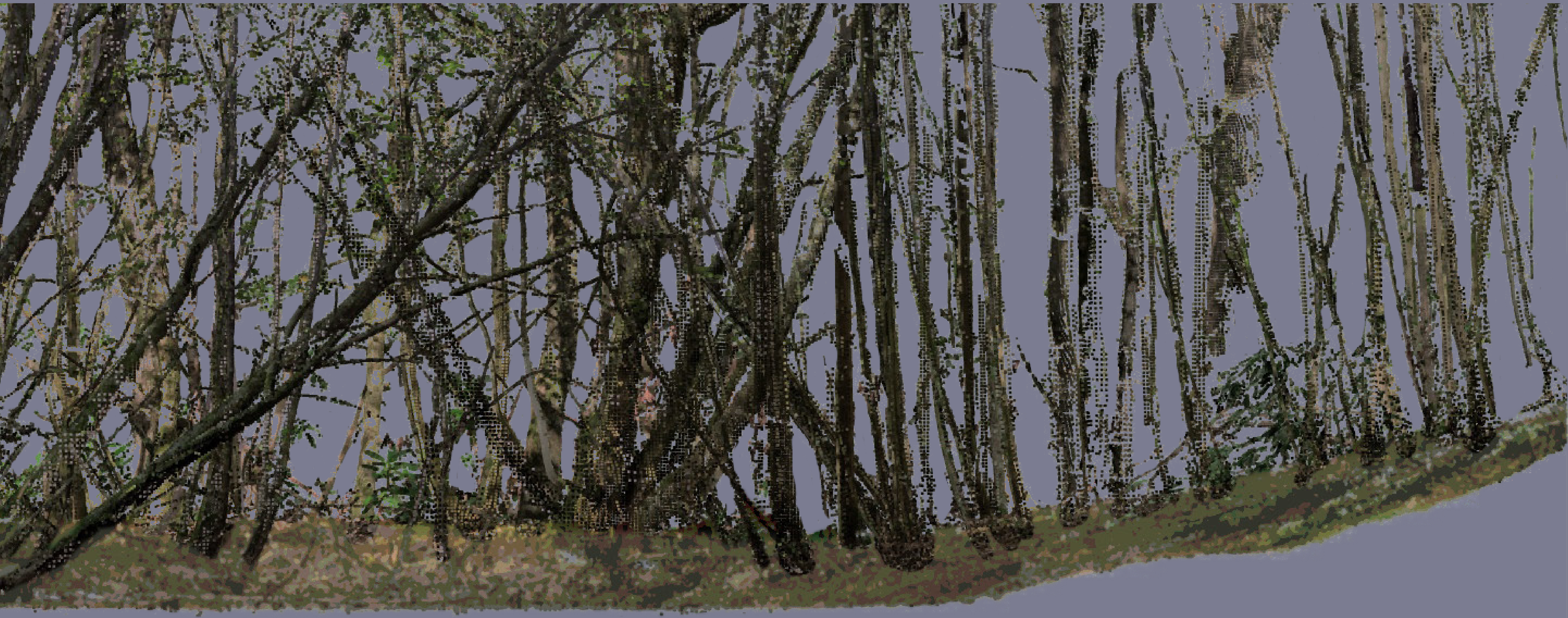
Measured Relative Humidity Around Ponds during Site Visit.



FLIMWELL FOREST COVER



SITE ANALYSIS

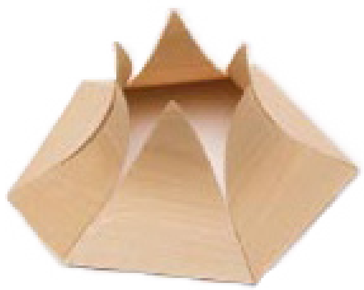


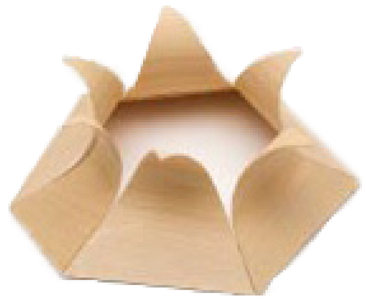
REFERENCES
HYGROSKIN PAVILION

MOVEMENT WITH HUMIDTY
RELATIVE HUMIDITY

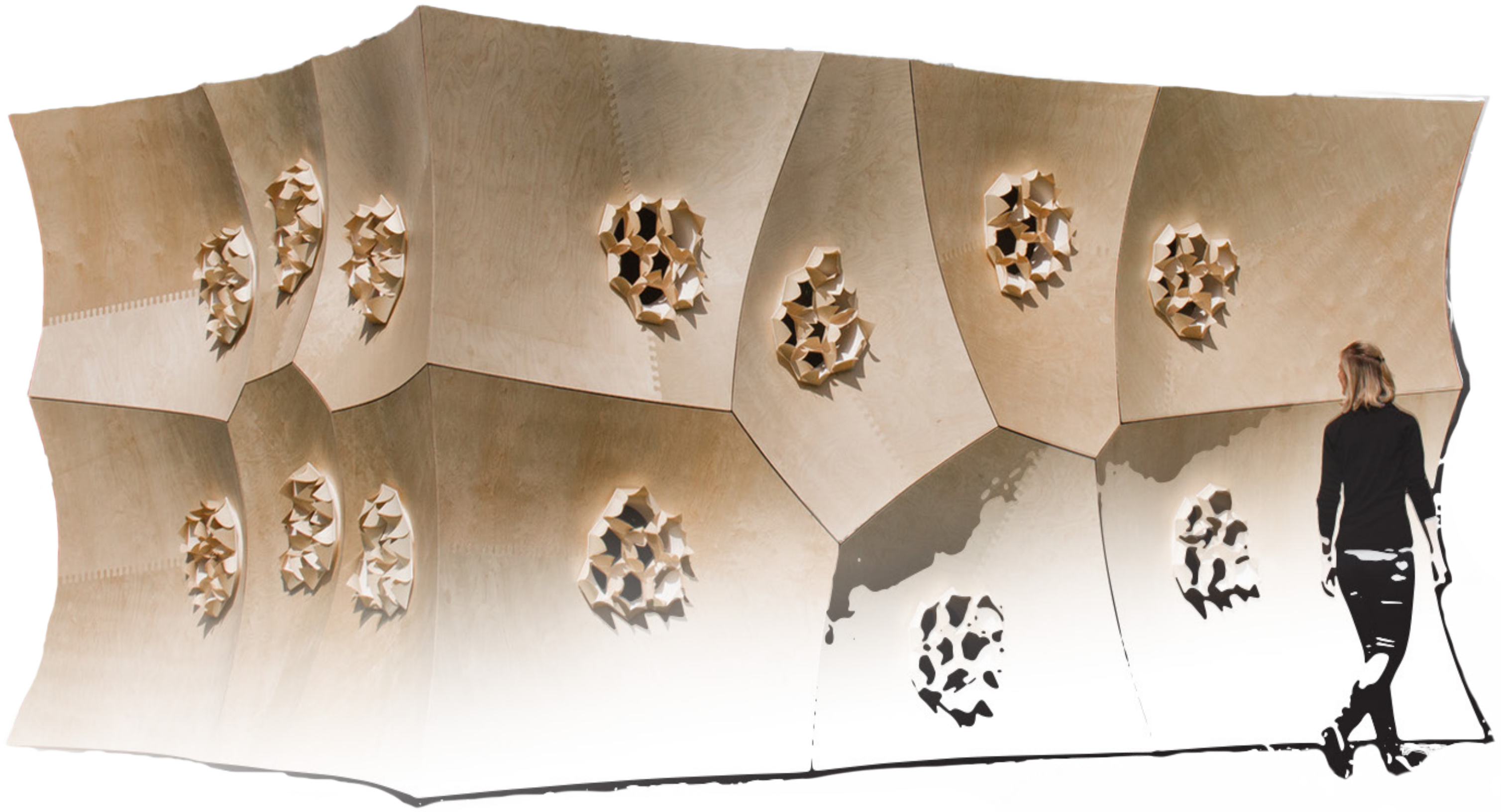

30% RH


43% RH

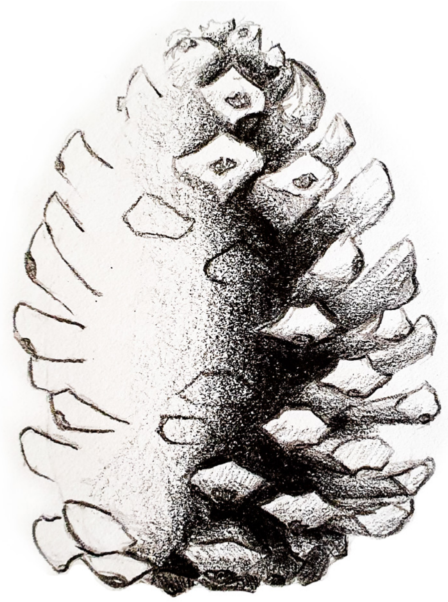

55% RH


69% RH

HYGROSKIN PAVILION
ACHIM MENGES ARCHITECT



Inspiration for investigating the manipulation of timber's hygroscopic properties came from the opening and closing of pine cones.



The Hygroskin Pavillion was one of the first structures to feature wood reacting to varying levels of humidity. Using extremely thin sheets of veneer, 'flowers' were created, 'blossoming' in higher levels of humidity. This is possible thanks to the hygroscopic properties of timber, which absorbs water molecules through its vascular cellulous structure. The cellulous structure is able to distribute the increased stress of the absorbed water molecules along its fibres, resulting in bending of the veneer.

REFERENCES
BLEED FURNITURE

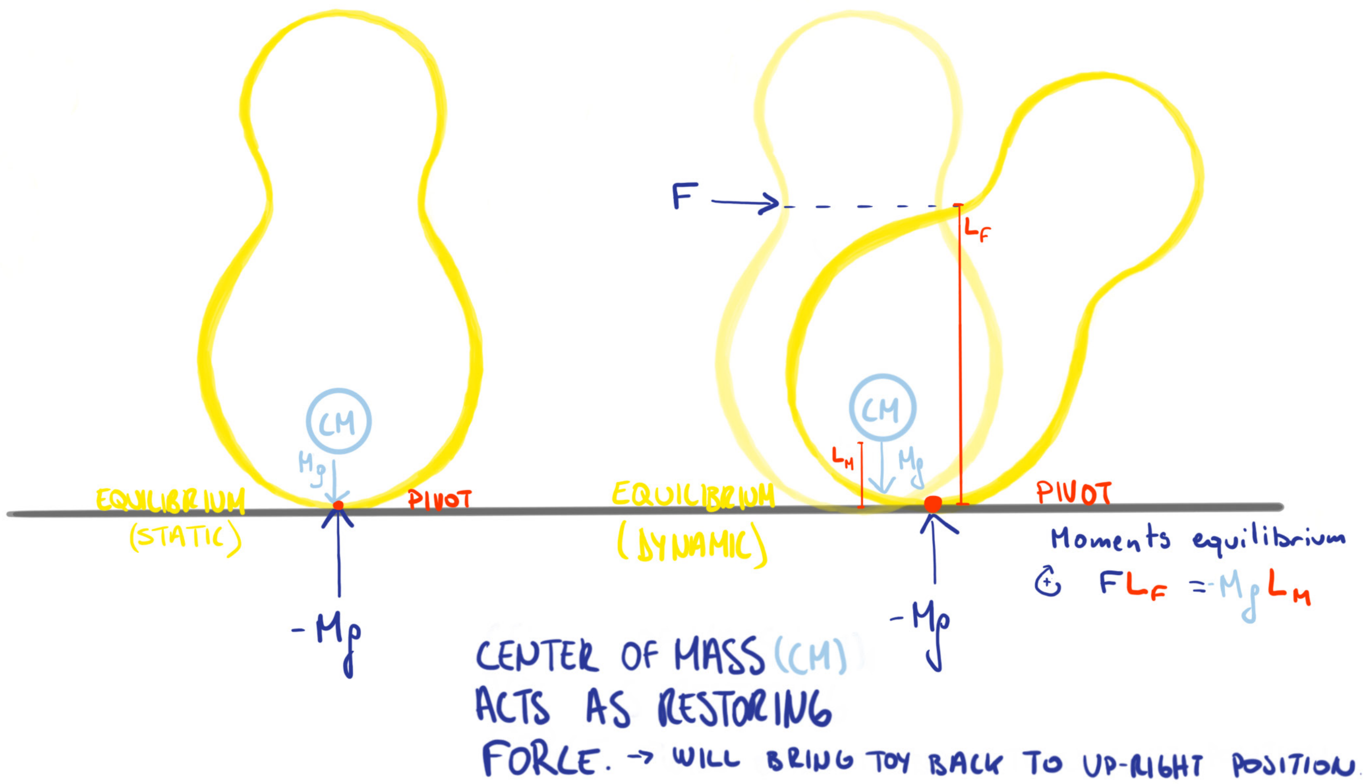
BLEED FURNITURE
PETER MARIGOLD

Bleed Furniture, a collection of simple cedar wood furniture by Peter Marigold, creates a black bleeding effect through localized ebonizing. Marigold entailed for the stain to provoke thought on how nature can re-capture man-made objects. Parallely, the stain enhances the wood's beautiful grain.

Ebonizing is a traditional technique used to darken wood, to mimick ebony. The staining happens thanks to a chemical reaction of iron and tanins found in the timber.

REFERENCES
WEEBLE TOY

WEEBLE TOY
ROMPER ROOM



The type of harmonic motion displayed by toys, such as the Weeble by Romper Room, inspired us immensely, thanks to its mesmerizing motion, through both tactile and visual engagement. This natural movement tied in perfectly with our perception of the subconcious, which is fed by multiple stimuli and not always can we define what we feel because of it.

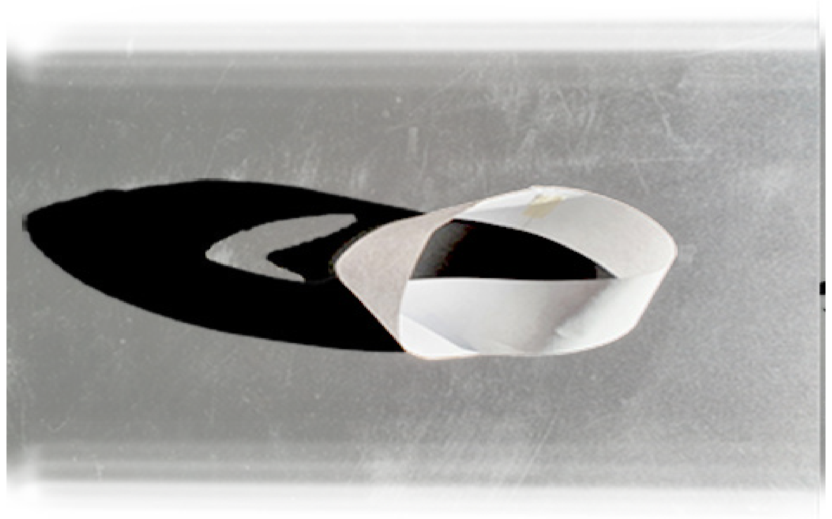
CENTER OF MASS CALIBRATION
DISNEY RESEARCH, ETH ZURICH, DARTMOUTH COLLEGE

Research from established institutions pushing the limits of center of mass calibration guided us throughout our experimentation, helping us understand and explore the limits of the returning-to-centre nature of our final structure.

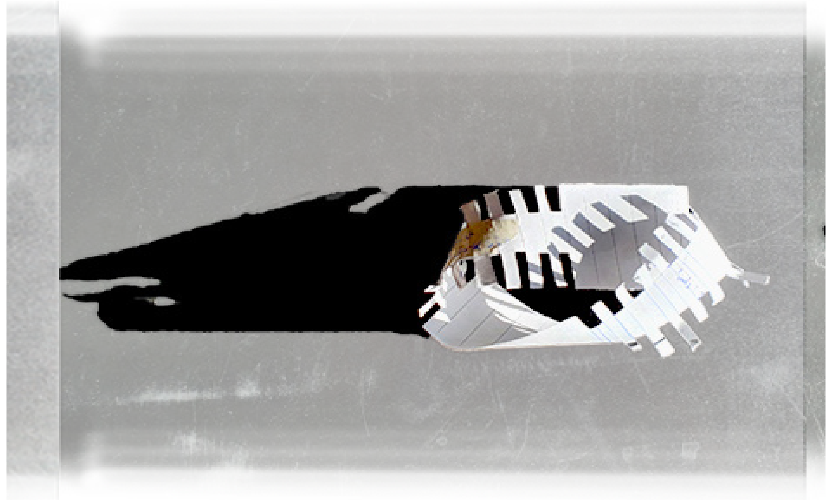
- Center of Mass

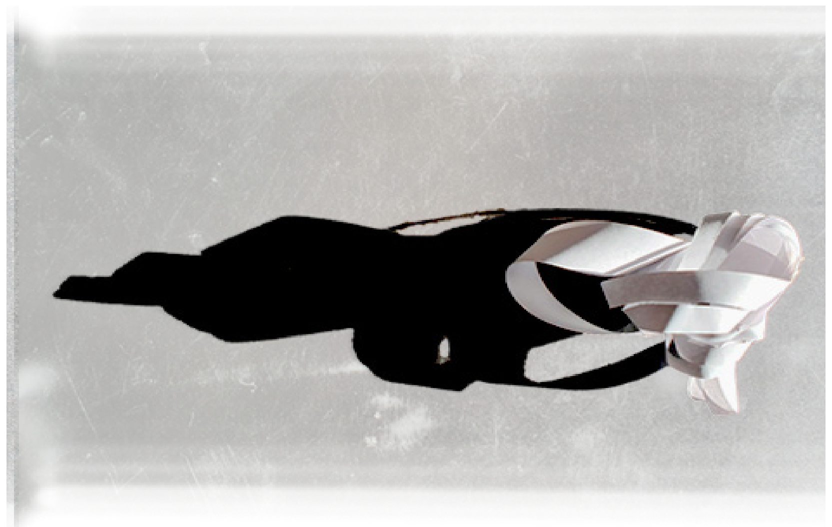
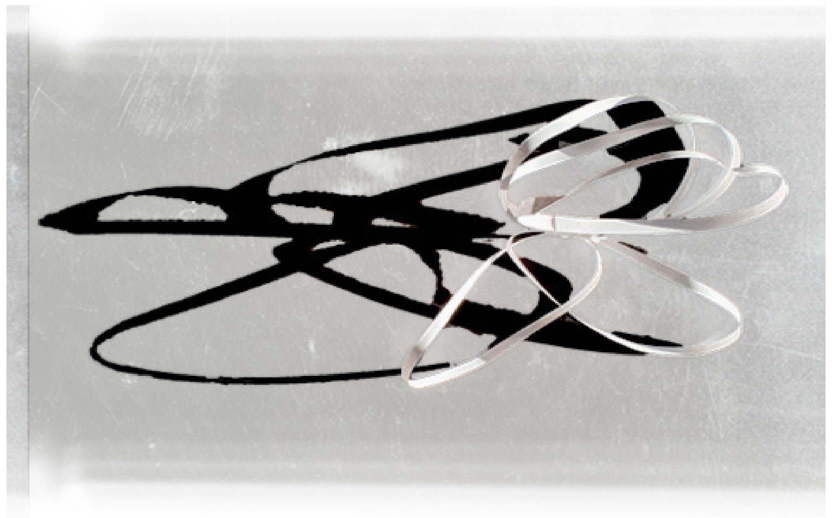
SHAPE FINDING
PAPER MODELS

SHAPE FINDING
PAPER MODELS

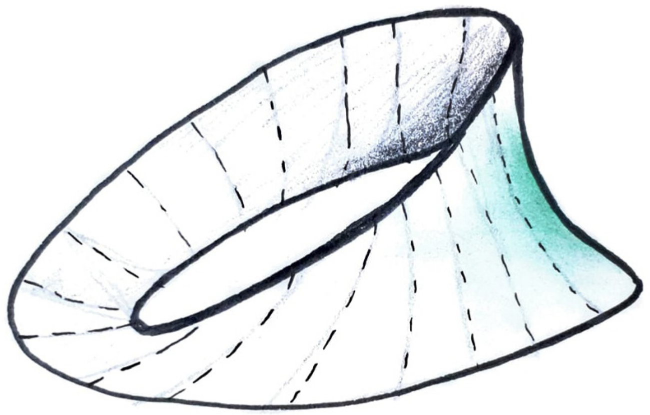


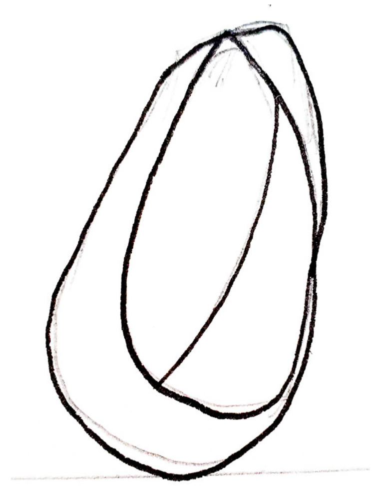

Exploration for the shape started through playing with paper.

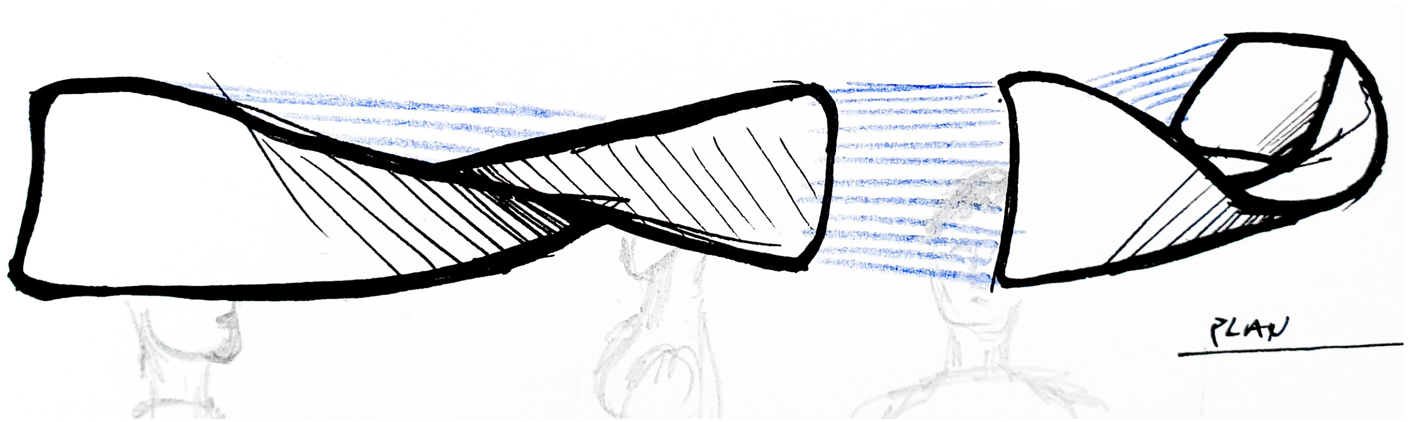


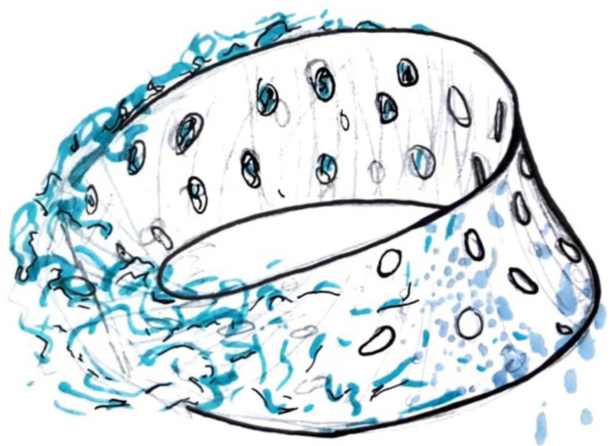



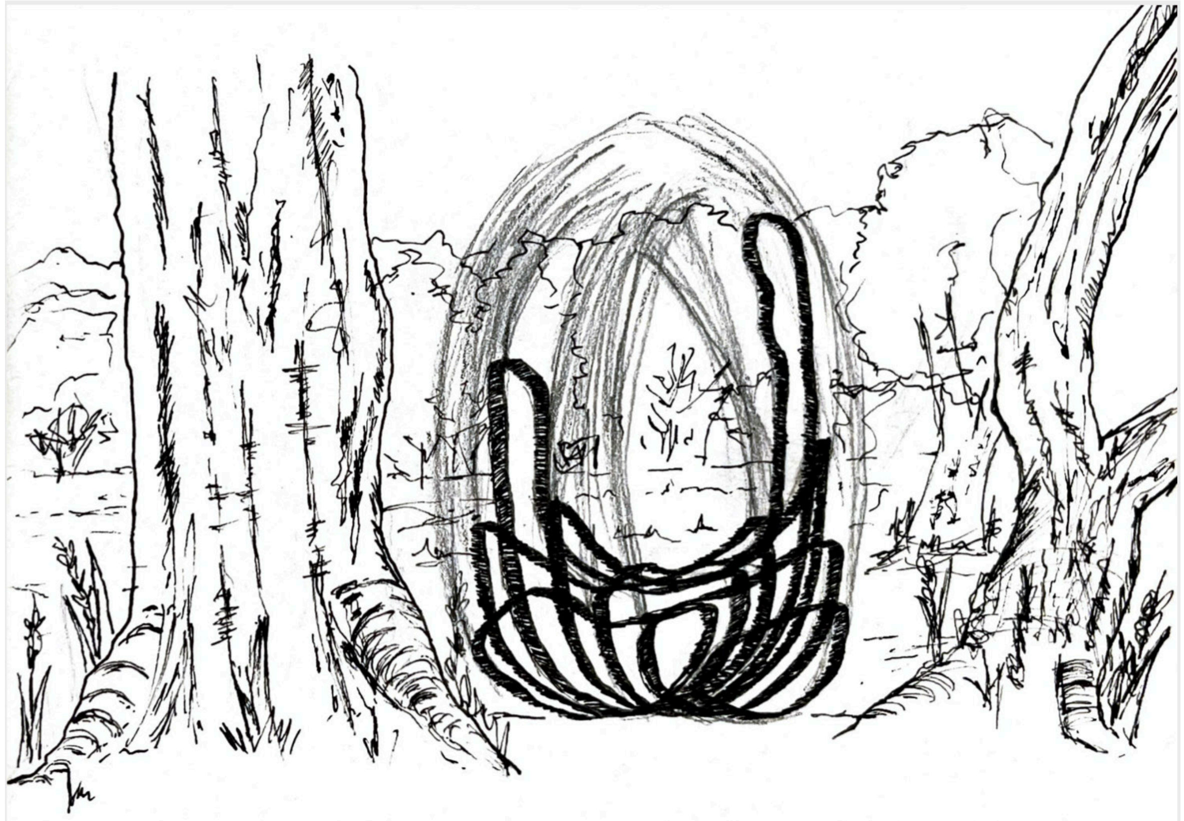
SHAPE FINDING
SKETCHES

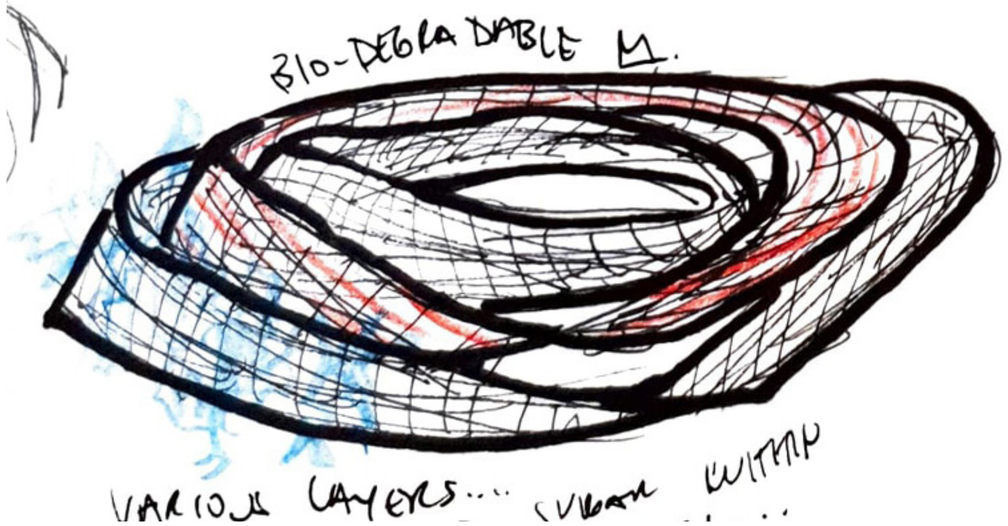


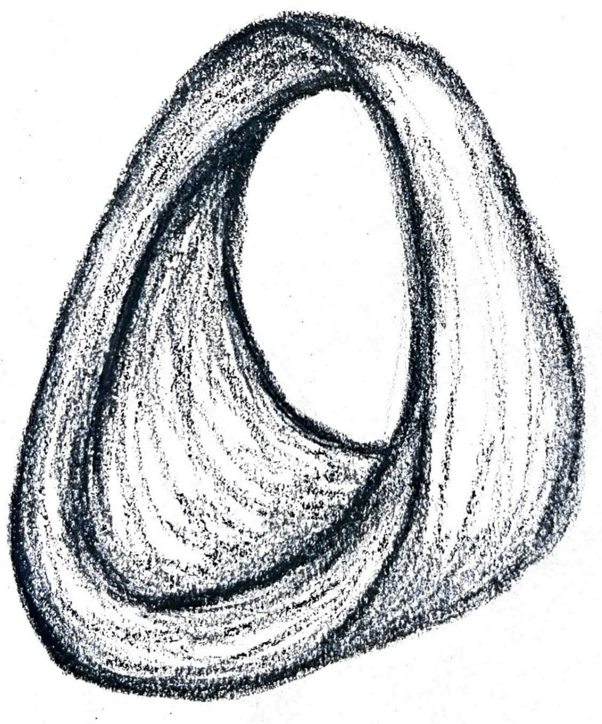


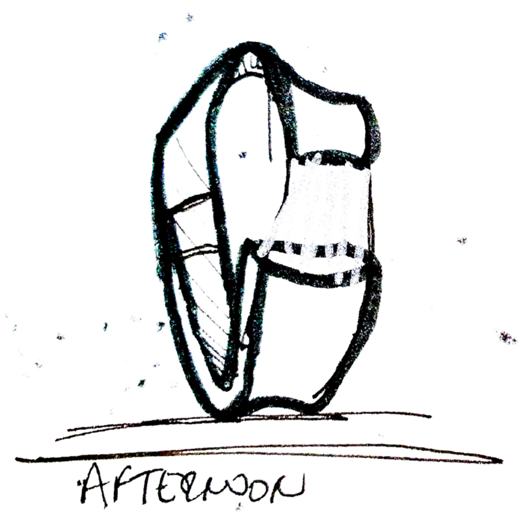


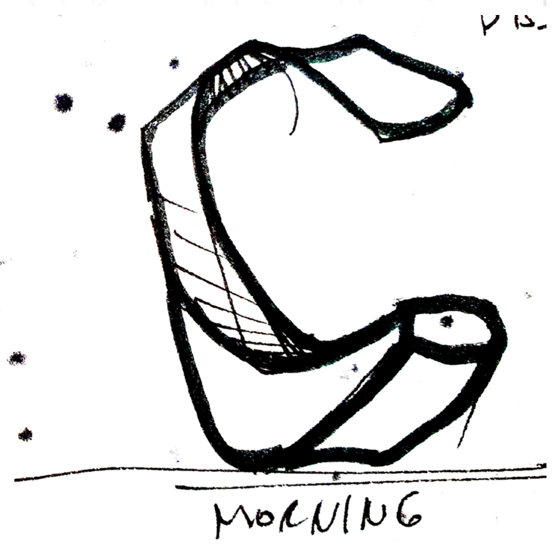


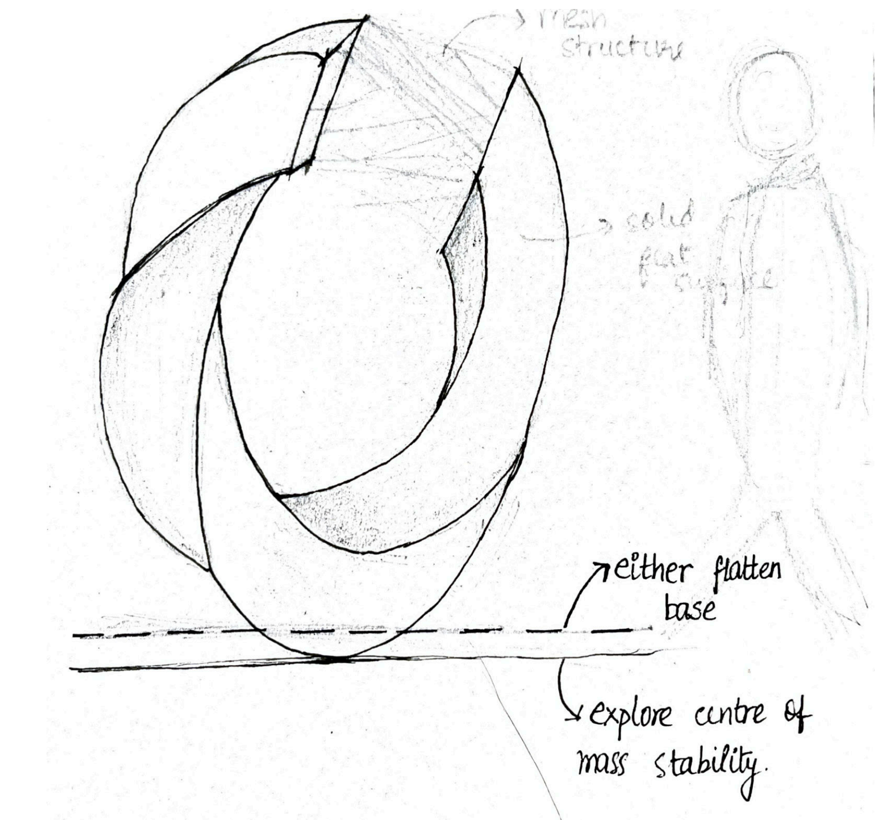












SHAPE FINDING
MATHEMATICAL MODELLING

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+6 | Y2_MathExam_FourierMultipleFunctionsAnalytical.m | w4_ws_q2to3_readingdata.m

```
%mobius strip graphing
% file name = mobius_strip_coded

clc ; clear;

R = 9*pi; % radius
W = 30; %width fo strip

%creating the mobius with meshed view
t = linspace (0, R , 100);
s = linspace (-(W), W , 100);
[s,t] = meshgrid(s,t);

%coding the mobius
syms s t;
x = (R + s.*cos(t/2)).*cos(t);
y = (R + s.*cos(t/2)).*sin(t);
z = s.*sin(t/2);

%plotting the mobius
figure(1);
fsurf(x,y,z, [0, 9*pi, -50, 50])
colormap (figure (1), 'hot')
```

MOBIUS EQUATIONS:

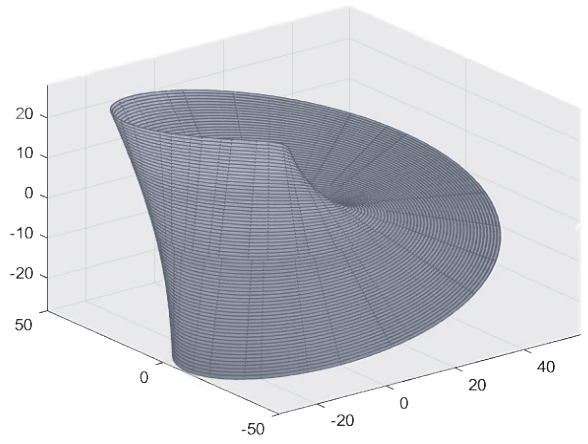
X = [R+S*COS(T/2)]*COS(T)

Y = [R+S*COS(T/2)]*SIN(T)

Z =S*SIN(T/2)

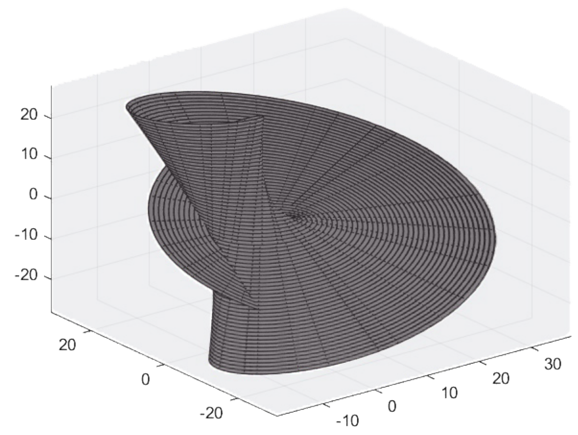
MOBIUS PROPERTIES:

- NON-ORIENTABLE
- SURFACE WITH A BOUNDARY, NOT A TURE SURFACE
- REPRESENTED BY 3D PARAMETRIC EQUATION



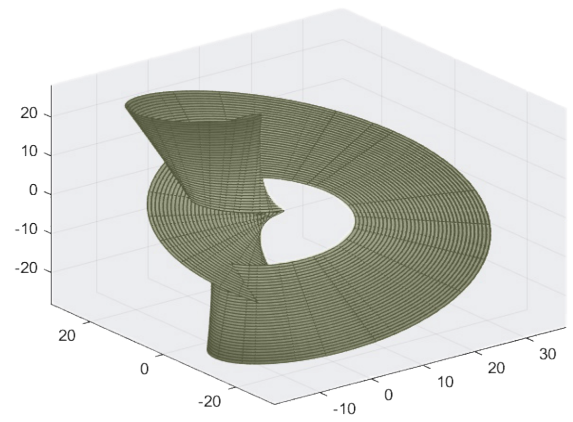
R = 9Л

W = 50



R = 9Л

W = 30



R = 6Л

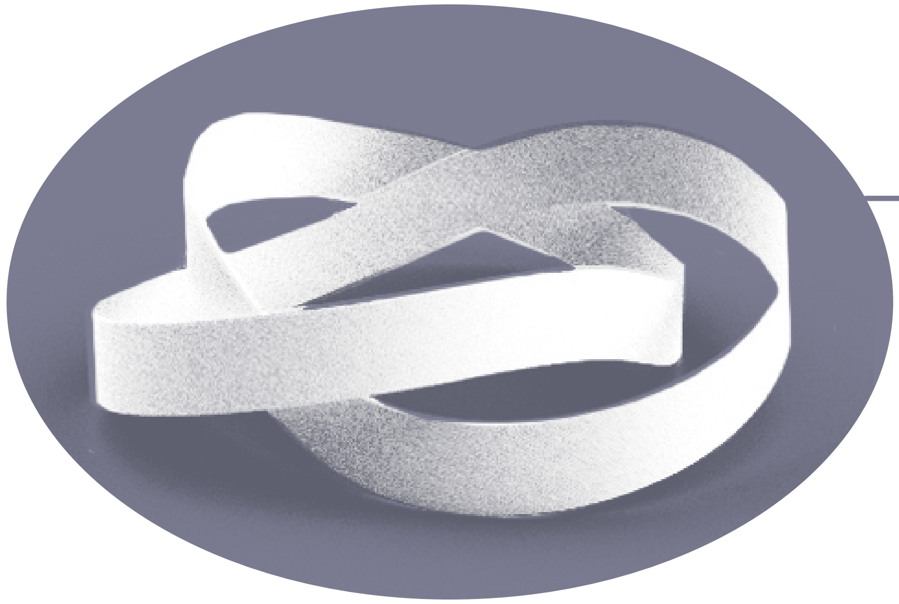
W = 50

R = RADIUS

W = STRIP WIDTH

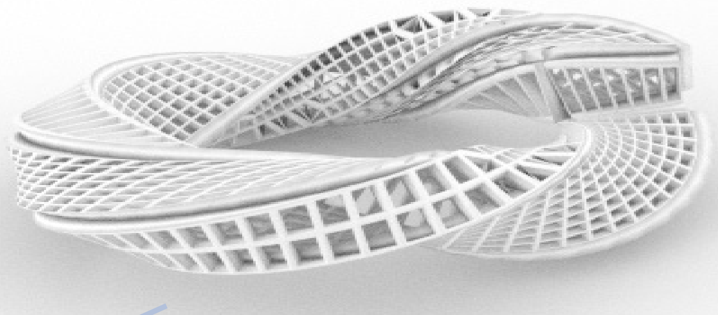
Investigation of the mathematical properties of the mobius strip led to a better understanding of the shape and was the basis of multiple Grasshopper models. Multiple turns of the mobius strip could be executed, but the complicated shapes made from the paper exploring proved had to model. This pushed us to embark on a primarily physically experimentative research process.

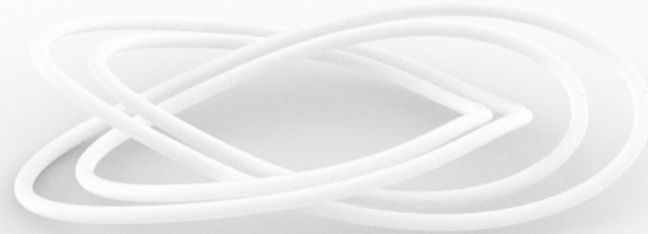
SHAPE FINDING
GRASSHOPPER EXPLORATION



Very similar to simple double-twist model, relatively easy to potentially construct.

Tubular structure, easy to visualize and potentially fabricate with range of materials.





Expensive to fabricate using nylon 3D-printing, helped spawn ideas on intertiwining dissolvable materials with the structure to show condensation cycle in the forest.

Very hard to fabricate, however its organic shape and gaps for light evoked may of the conceptual ideas.

MATERIALS
EXPLORING AND TESTING

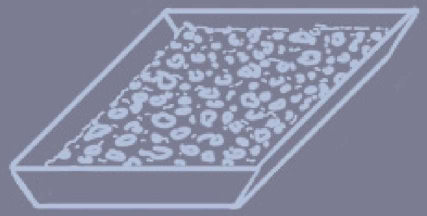
The aim of our material exploration and testing was to find viable materials which would react in humid conditions, similar to the behavoir of the Hygroskin Pavilion.

Mainly organic materials were explored, which could show a visible reaction with humidity, for example, dissolving or allowing condensation to form on it.

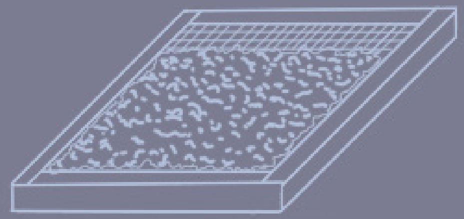
MATERIALS
PAPER MAKING

PROCESS

Scrap paper is ripped by hand into small pieces. It must be ripped and not cut to allow the cellulose fibres to stick outwards, later acting as binding agents.



The pieces are left to soak in water overnight.



Afterwards, the pieces are flattened onto a grid screen and let dry for a day.

Once dry, the paper is peeled off the screen.

TESTING

The paper was tested for its behavior in high humidity conditions by leaving it in a steaming pot for 1 hour. However, none of the different papers tested presented any apparent changes in the humid conditions, leading us to trial other materials.

PAPER VARIATIONS

100% paper

1/3 green leaves,
2/3 paper

1/3 dry leaves,
2/3 paper

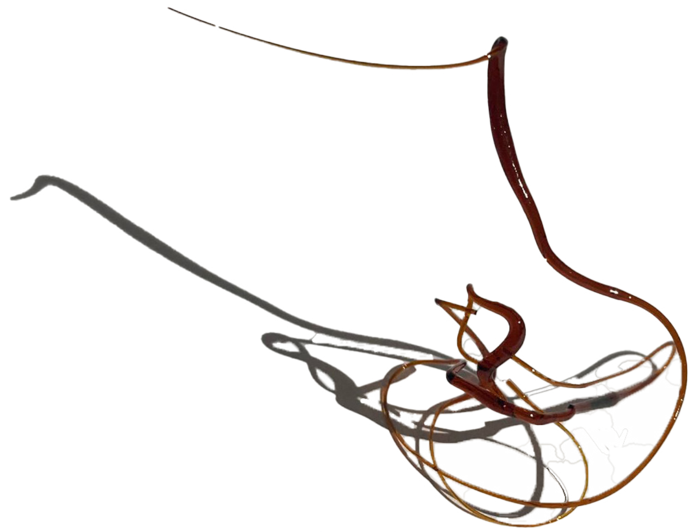
MATERIALS

SUGAR MAKING

SPINNING

Inspired by DIY cotton floss making techniques, a whisk was dipped into hot caramel and then spun and dripped onto a spoon or stick to create fragile intriquette structures.

PULLING



Similar to the spinning technique, a spoon was dipped into the hot caramel and pulled, creating thicker strands.

SPREADING

This technique involved spreading the sugar to obtain a sheet of caramel.

TESTING

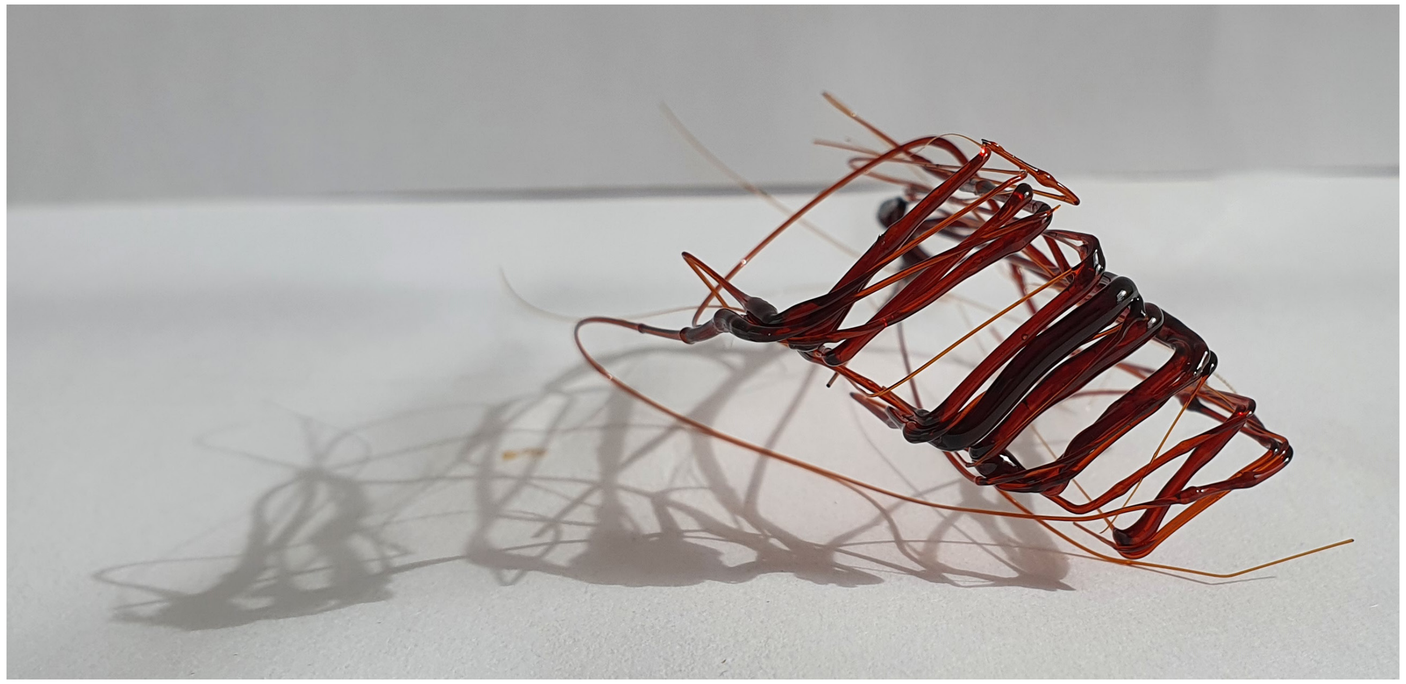
The different sugar structures were left outside for a night, where humidity increased during the night, resulting in the caramel slowly appear to melt. This is because the sugar dissolved in the water present in the air which allows it to move downwards on the structure. This was one of the only materials tested that showed a significant visual reaction after long exposure to humidity.

MATERIALS

SUGAR OBSERVATIONS

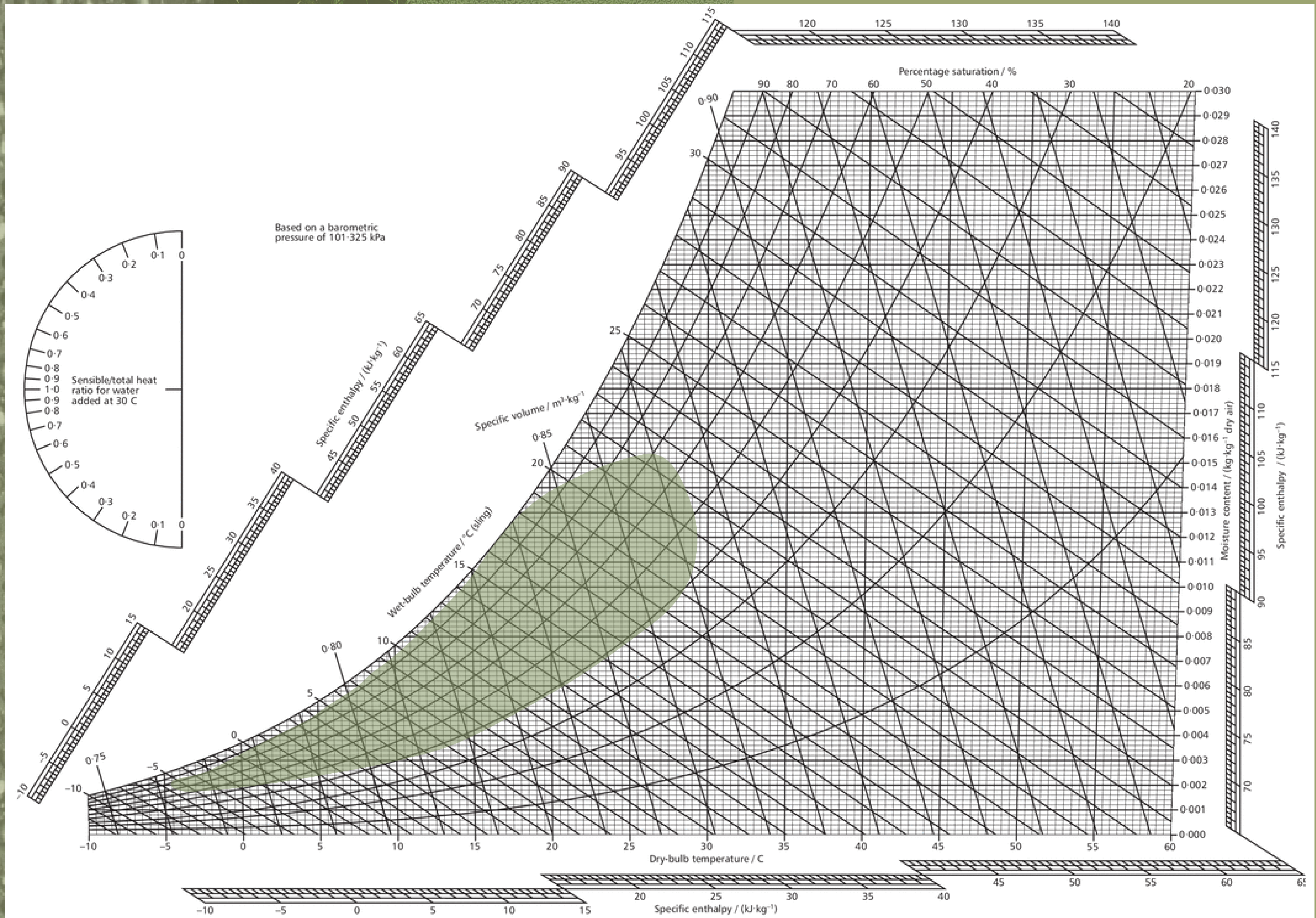
All the sugar models were made from a base of cararmel, which was simply sugar cooked to a temperature of 160°C. The models dissolved after a long exposure to humidity. Additionally, the forms created visually engaging shadows, which could be beneficial to our final object.

However, a drawback of this material is its brittle quality, which would require it to be applied directly on the structure before transporting it to the forest, risking breakage during transportation to the site.



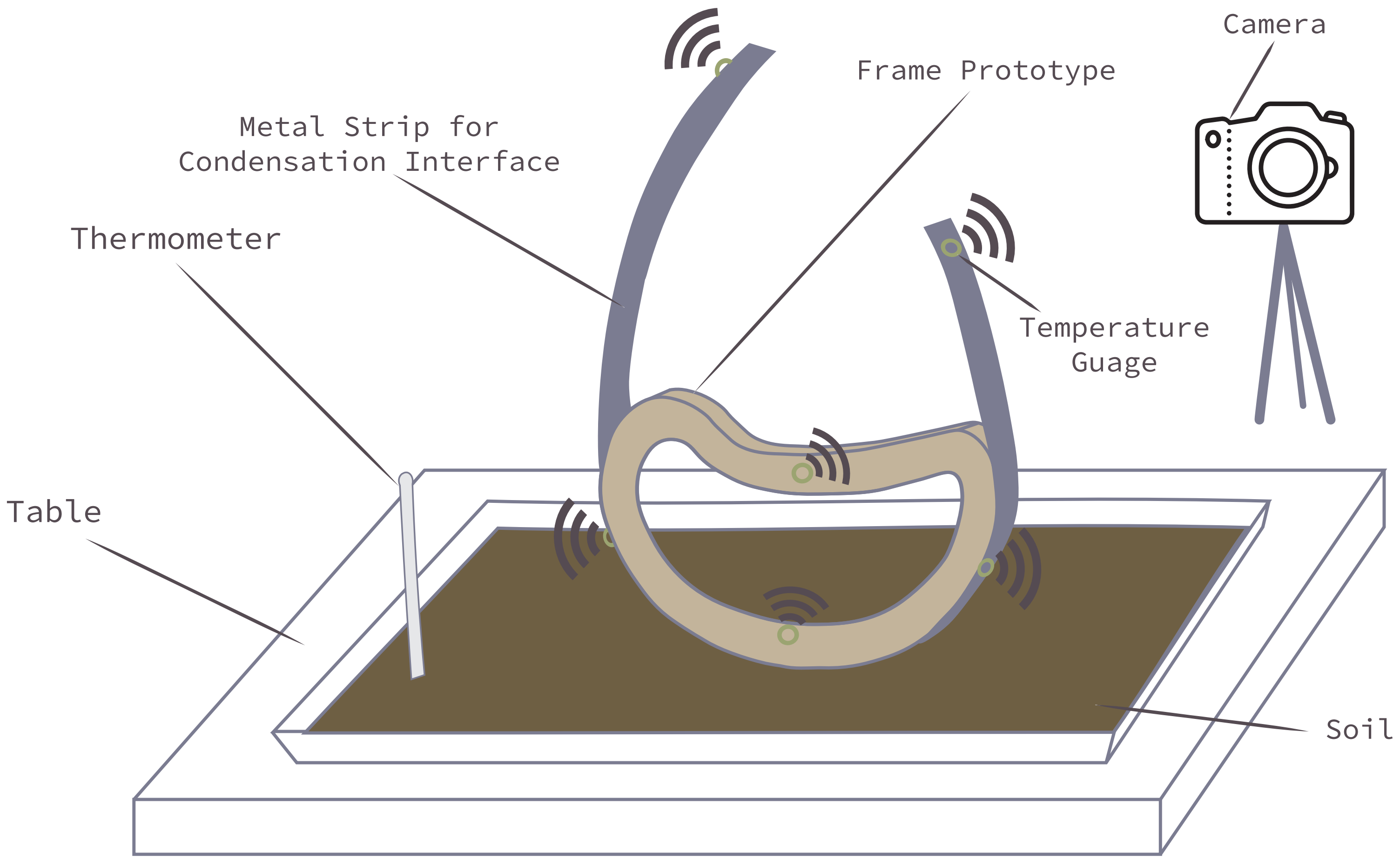
MATERIALS

METAL TESTING



The pyschrometric chart shows at what temperature and relative humidity condesadtion will form at. Condensation forms at 100% air saturation (eg the air cannot contain a higher water molecule concentration), and there must be a temperature gradient between a surface and the air. Thanks to the chart, mapping the air drybulb temperature and relative humidty showed at what temperature the surface must be for condensation to form on it. This chart shows the relative comfort zone of a person in Uk climate, and it was used to estimate the temperature the metal surface had to be to form condensation in Flimwell conditions.

MATERIALS
METAL TESTING

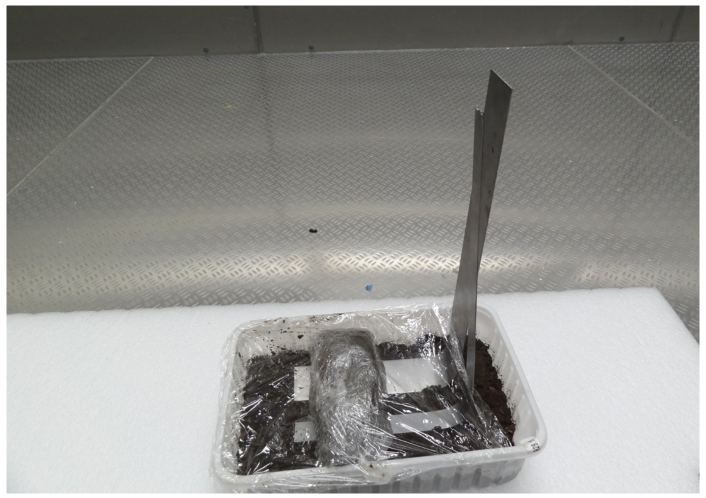


GENERAL SET-UP

The experiment aimed to investigate:

- The **area of metal** that needed to be in contact to facilitate condensation formation
- The **thickness** of a metal strip in condensation formation
- The **height** of the strip above the ground contact point.

The general set up included a tub of soil that was kept at a constant temperature, temperature guages on the metal and the metal-ground contact point, as well as a camera to document the process. The room as kept at a constant temperature of 20∘C and 80% RH. According to the psychrometric chart, the metal surface had to be at a 16.5∘C at these conditions for condensation to form on it.

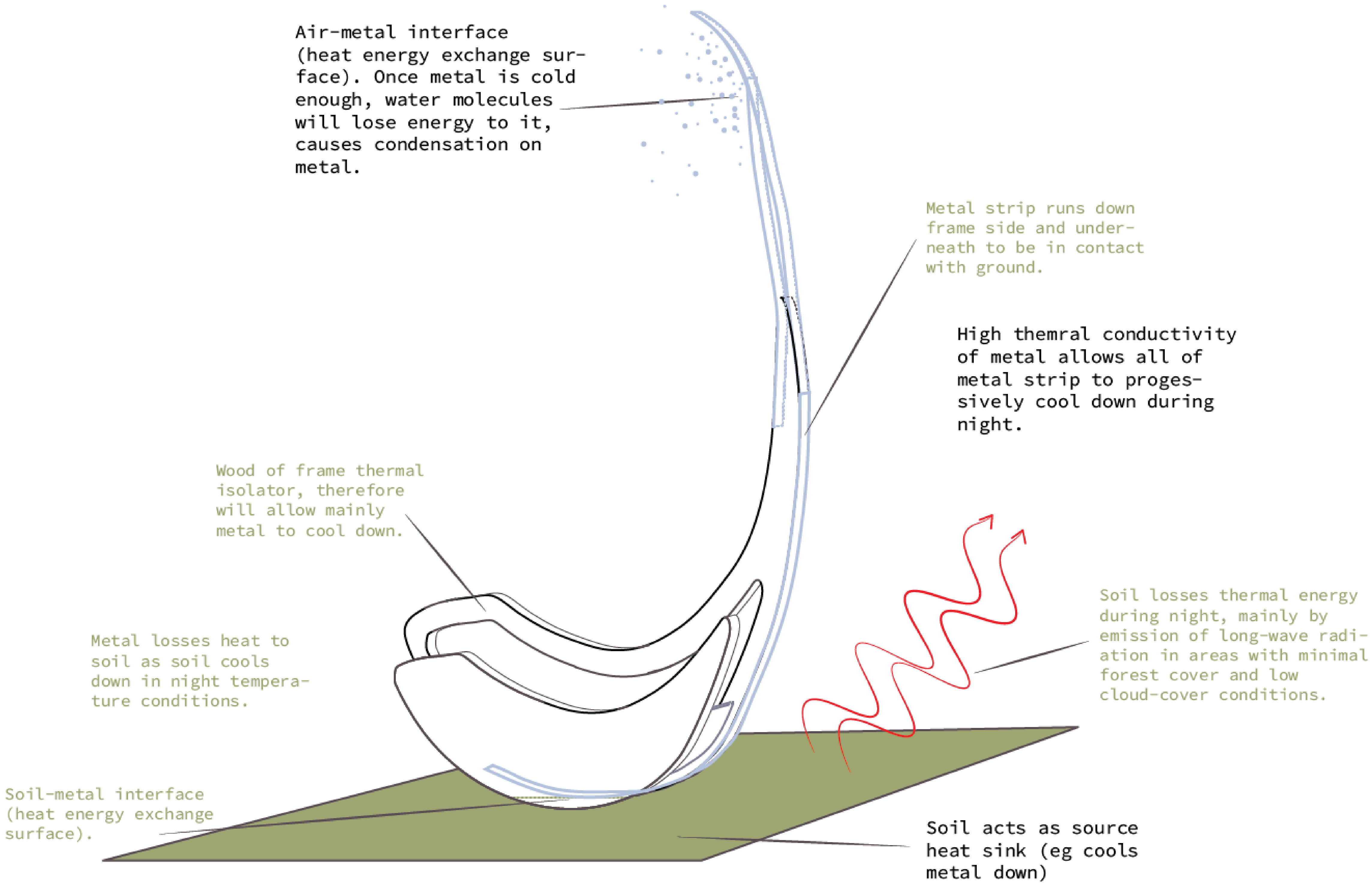


This experiment was undertaken in the HereEast humidity labs. The aim was to prove that condensation could form on the metal using soil as a heat sink, and that it could be a viable material to use in our final object.

MATERIALS

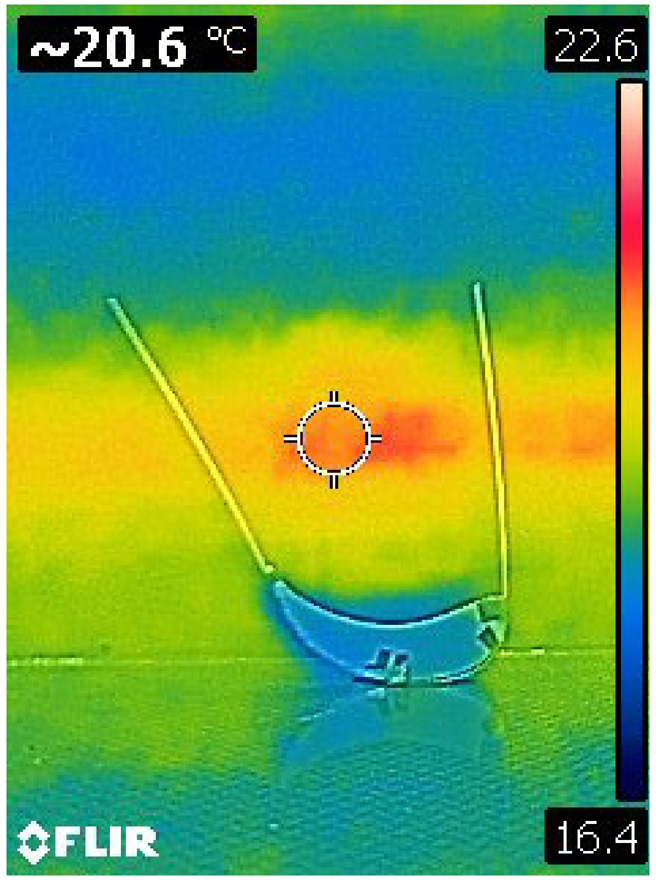
METAL OBSERVATIONS

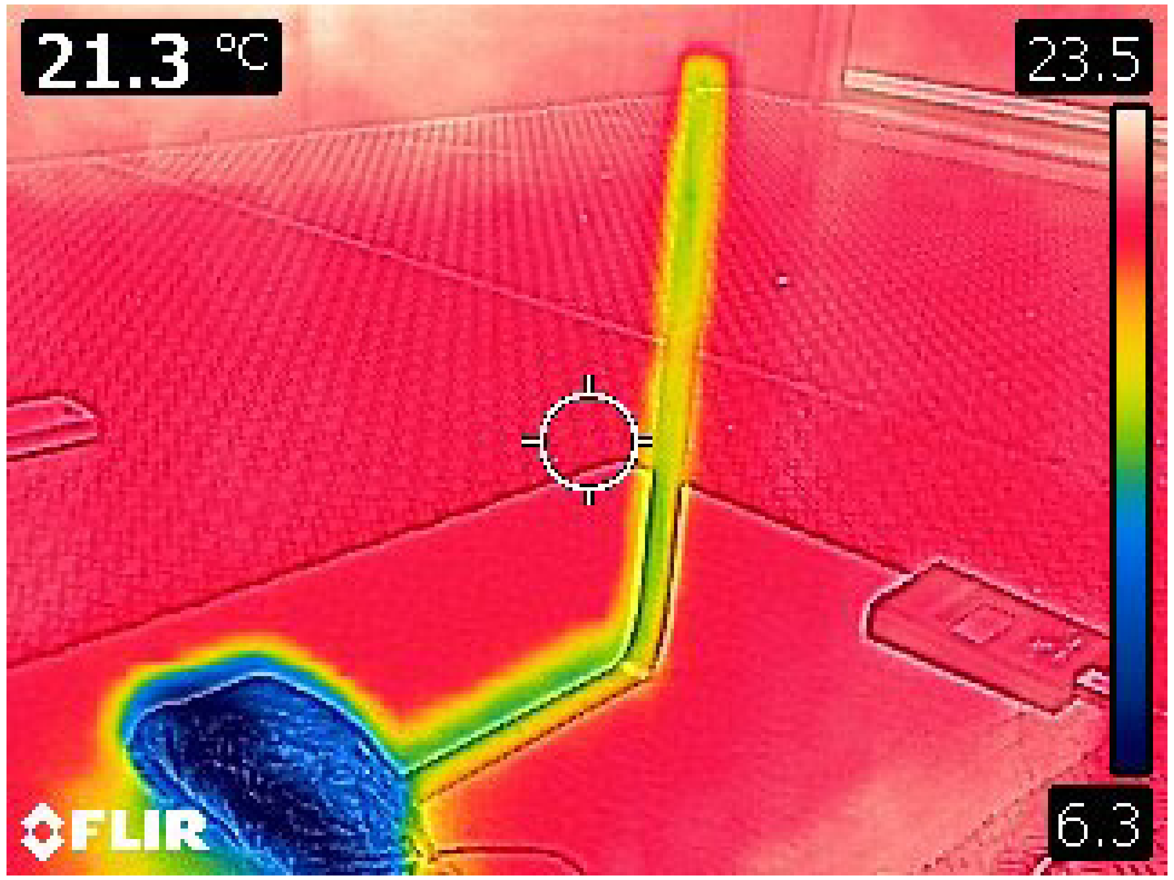
We hoped to use the experiment to prove a concept to create an interface where condensation would reliably form in the forest winter conditions.

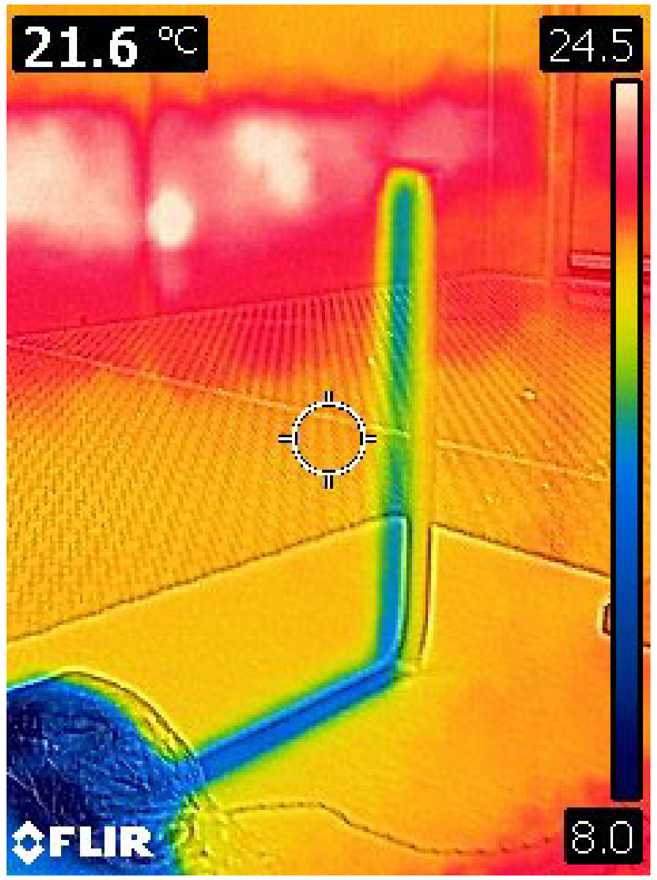


MATERIALS

METAL OBSERVATIONS







Due to our time constraint, we could not further pursue investigations into thermally-conductive metals, or using the ponds present on the site as heat sinks.

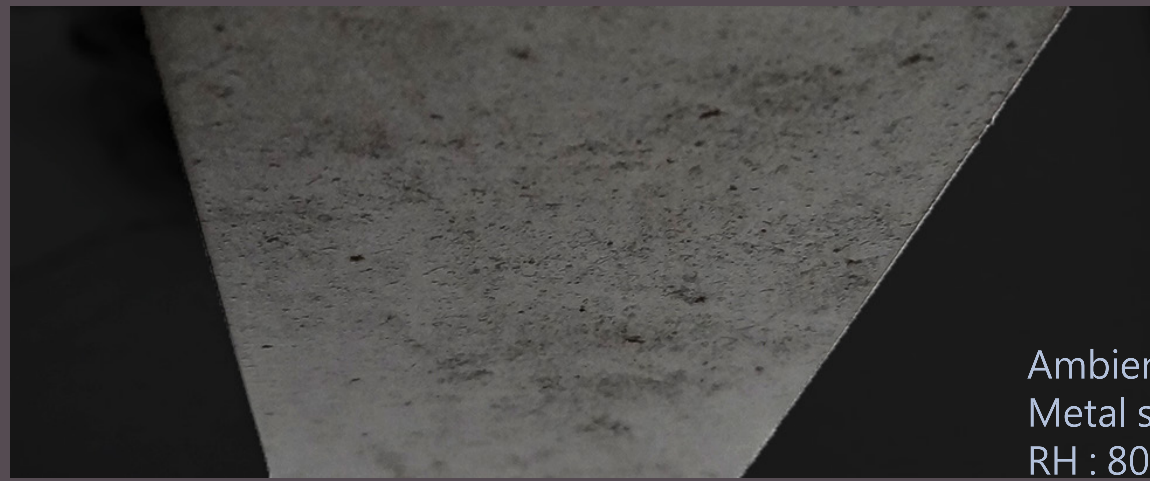
Additionally, in the future a greater number of smaller experiments should be done over the design period, in order to contemporarily solve design, engineering and environmental problems, rather than basing our design on an untested concept.

MATERIALS

METAL OBSERVATIONS

The overarching conclusion of the experiment was that the metal strip could not be used in the way we'd wanted too. The metal tested did not form condensation at the pre-defined 3°C temperature difference between the air and the metal surface, only at much larger temperature differentials such as 10°C-13°C.

This entailed that the soil would have to be at least 10°C degrees colder than the air around it in order to cool the metal down. Most likely this would have to be an even larger temperature difference in order to cool down the entire length of the metal strip to allow visible droplets of condensation to form. In forest winter conditions, this meant that at a wet-bulb temperature of 5°C and relative humidity of 80%, the top-soil would have to be at least -5°C. Research on surface-soil temperatures in forests of similar characteristics showed that soil-surface temperatures would likely only reach 2°C or 3°C. Hence, the result we wished to achieve with our design concept was proven non-viable, leading us to have to find a different method to show condensation formation.



Mist/sheen of water forming on surface

Ambient temp. : 20°C
Metal surface temp. : 13°C
RH : 80%

Small droplets visible

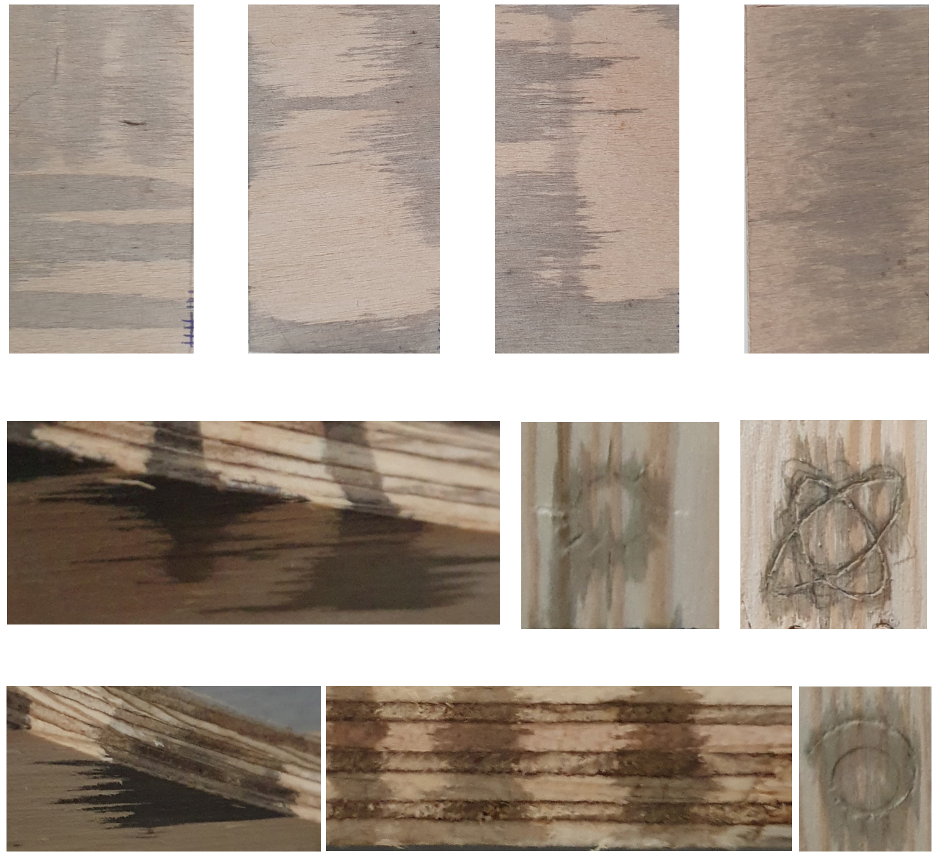
Ambient temp. : 20°C
Metal surface temp. : 10°C
RH : 80%

Significant droplets forming, desired effect

Ambient temp. : 20°C
Metal surface temp. : 7°C
RH : 80%

MATERIALS

STAINING



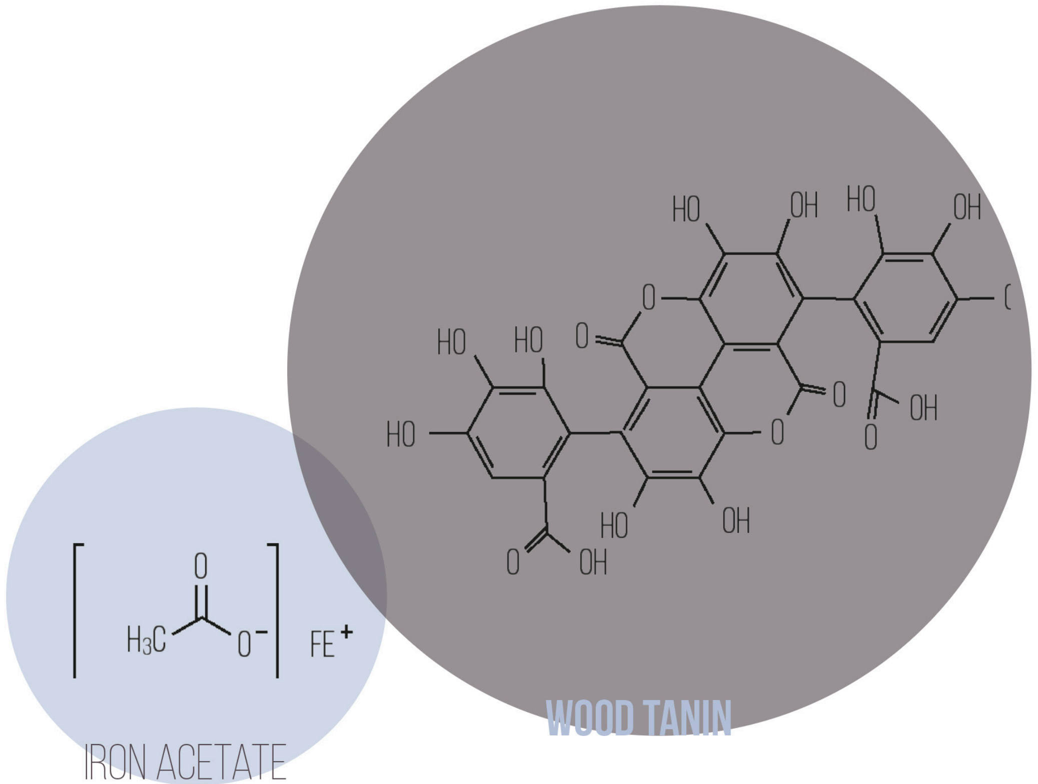
Painting in the direction of the wood grain was the best method to stain the wood, as the stain would naturally move down the cellulose fibres.

Testing was done to see how many layers of iron acetate would produce a dark stain. Appying a layer of black tea produced much darker stains. This is because black tea contains tanins, inherently increasing the tanin concentration in the wood.

PROCESS + SCIENCE

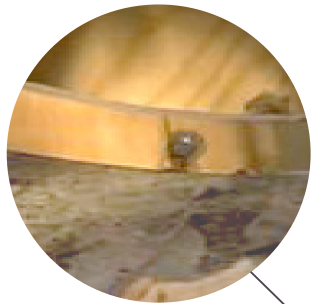
The staining process used is traditionlly called 'ebonizng'. This involves reacting iron acetate with tanins chemicals in the wood, producing a complex ferric tanin, which turns blacks and appears to stain the wood.

This could be used to show condensation by creating a stain near to the steel joints of the frames, were subsequent formation of condensation or exposure to rain would continously move the reacts downwards, elongating the stain.



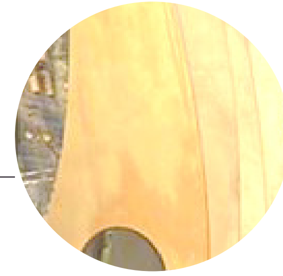
STAINING

FINAL MATERIAL CHOICES



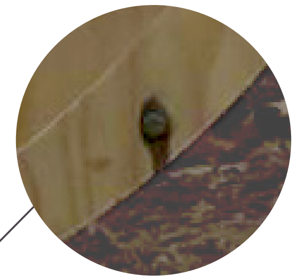
10MM DIAMTER MILD STEEL RODS

Rods could be cut with accessible machines and easily transported and hammered into frame. Allows staining reaction to continue on wood contact points.



20MM BIRCH PLYWOOD

Easy to CNC and meets strength requirements of frames. Visible grain colours.



IRON ACETATE + TANIN STAINING

Naturally-occuring reaction with acid particles in rain and tanins present in wood. Acid rain dissolves iron which reacts with tanins at the wood-steel contact interface. Condensation forming on the frame will continously move the reactive particles downwards, elongating the stain.

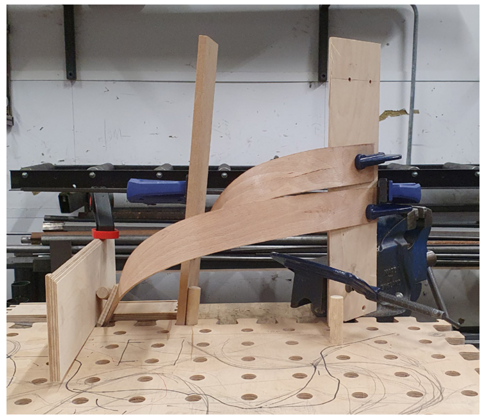
FABRICATION PROCESS

STEAM BENDING

WOOD TYPE:
OAK

PROCESS

1. The oak strips were put into the a steamer and left for 20mins.



2. The strips where direclty bent and clamped onto a customized jig and left for 1 hour.

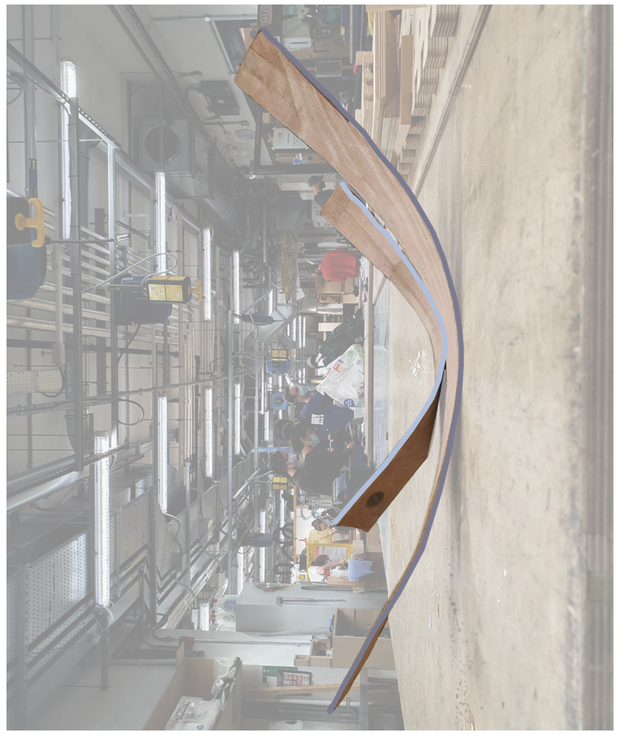
3. The strips were connected to the metal by melting a plastic around them. Filler wood had to be added to make the metal and wooden strips meet.

Trying to replicate a frame held together by bottom thin layers of steam-bent wood and twisted mild steel metal strip. Gap created by the wood strips would be used to adjust the models center of balance.

FABRICATION PROCESS

STEAM BENDING OBSERVATIONS`

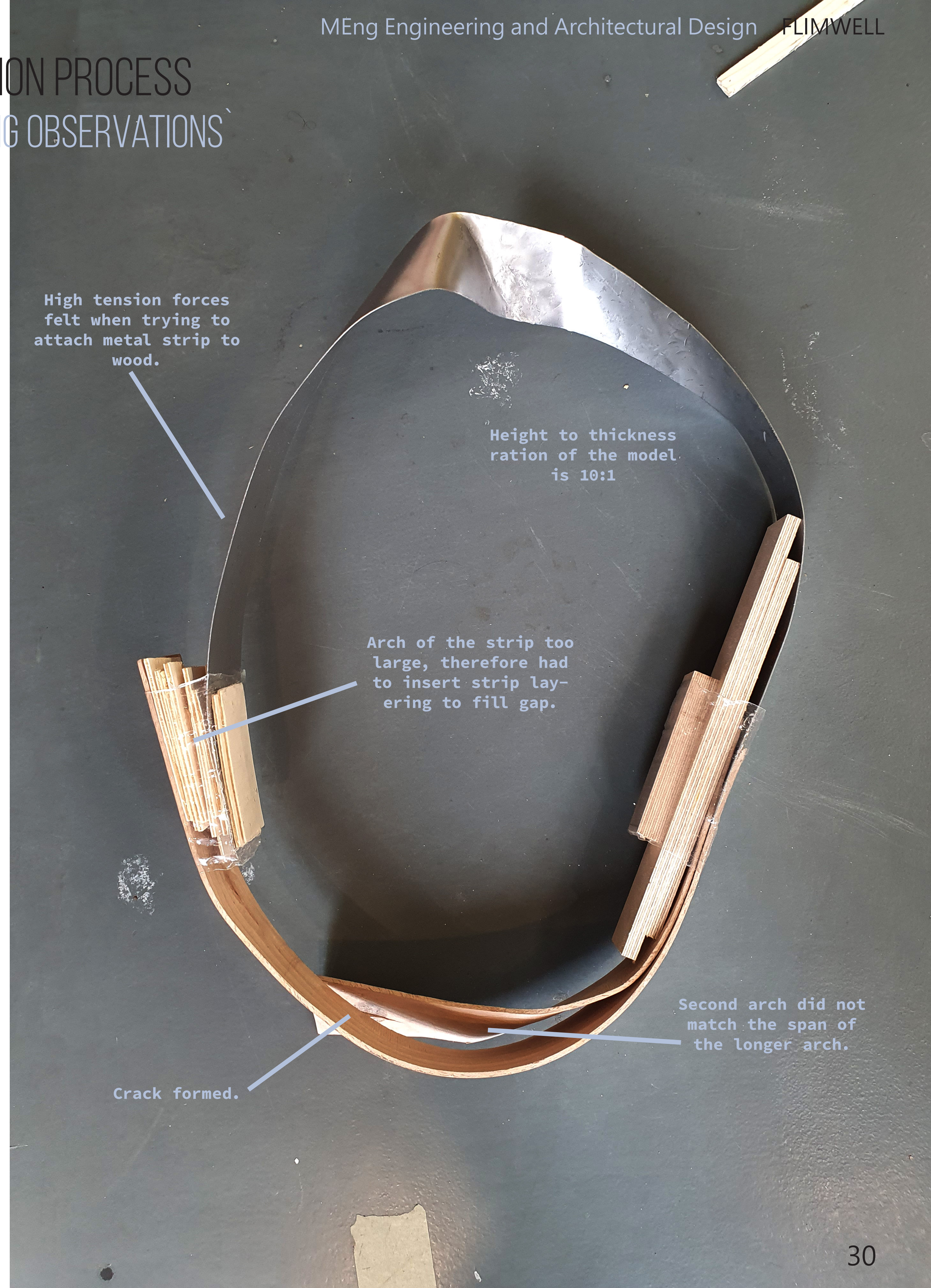
BOUNCE-BACK



OBSERVATIONS

Steam bending proved to be much harder than anticipated because of the level of accuracy needed in creating the jig, and in finding a method to connect the metal to the wood without deteriorating its structural integrity.

Even though the elegance of steam bending was evident, the drawbacks of the technique were numerous. This included the time to make a perfect jig and the level of precision needed to be able to screw the strips together. As well, scaling the project would require thicker timbre strips and would be expensive, as the best wood for steam bending is untreated oak. Lastly, this technique is slightly unreliable, due to varying bouce-back distances of the wood and potential cracks forming.

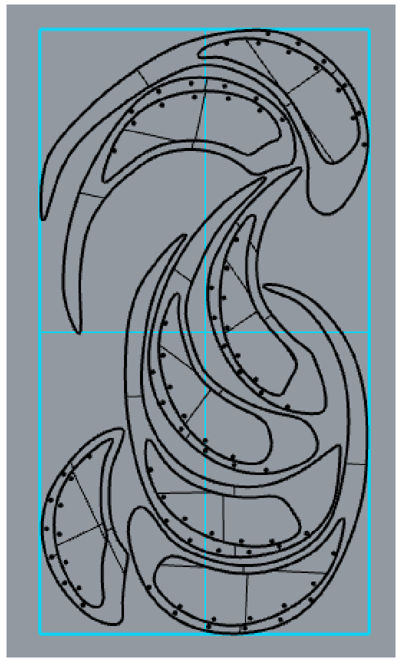


FABRICATION PROCESS

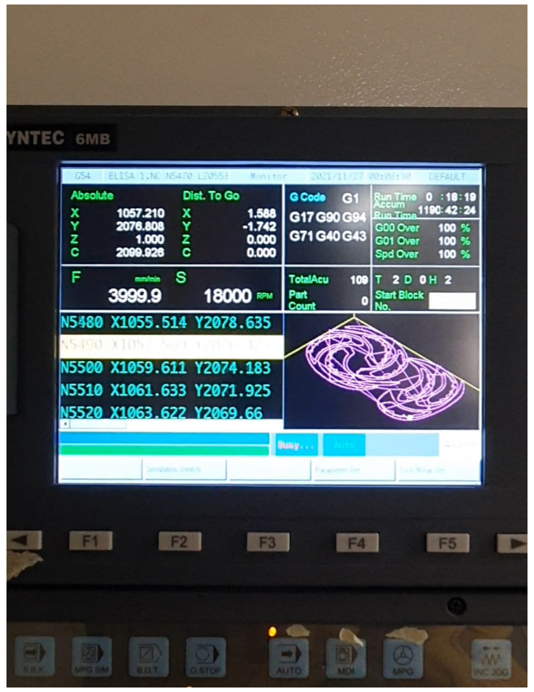
CNC CUTTING

WOOD TYPE:
BIRCH PLYWOOD

PROCESS



1. File designed on PC



2. File set up for CNC machine.

3. CNC cuts out 2D shape.

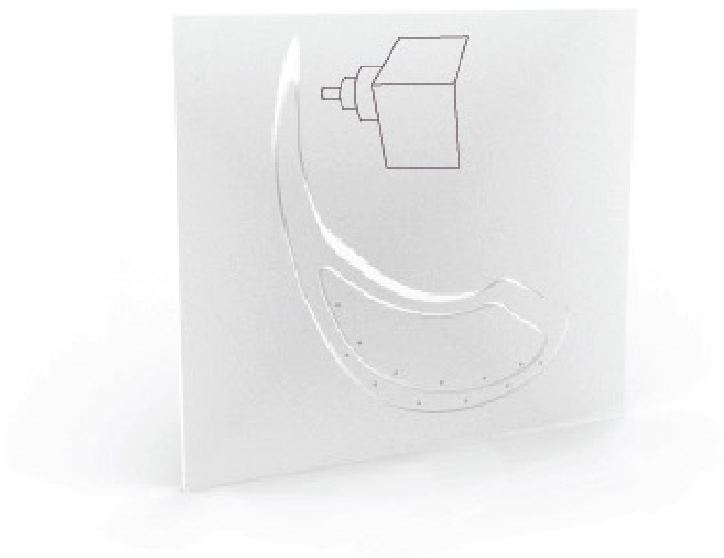
OBSERVATIONS

Using a CNC is very time effective and highly precise. Even though we only used it for cutting in 2 dimensions, the has the ability to cut in 3 dimenstions, allwoing for increased possibilities for the design. Thanks to the short time it takes to cut, the design process could last longer, allowing a more thought-out final design.

The CNC however could potentially be material ineffcient, however this challenge was overcome in our design by using the offcuts as structural elements.

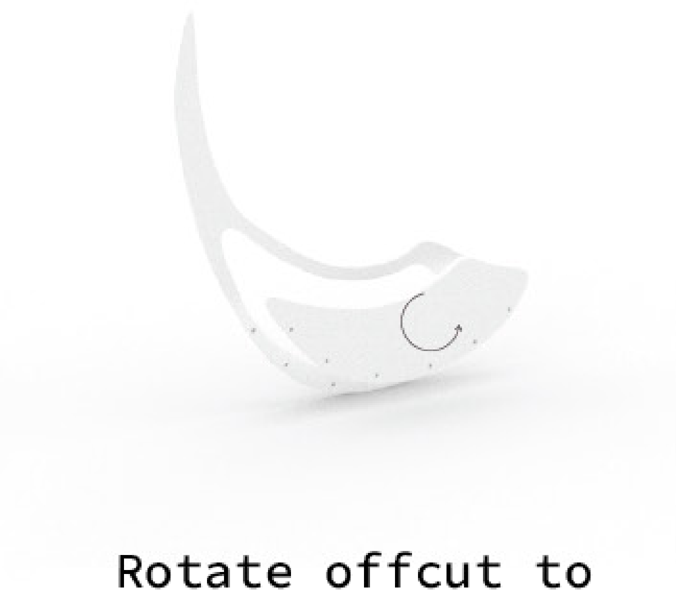
FABRICATION PROCESS

BUILDING PROCESS



Cut the frames

Pop out the inside offcut



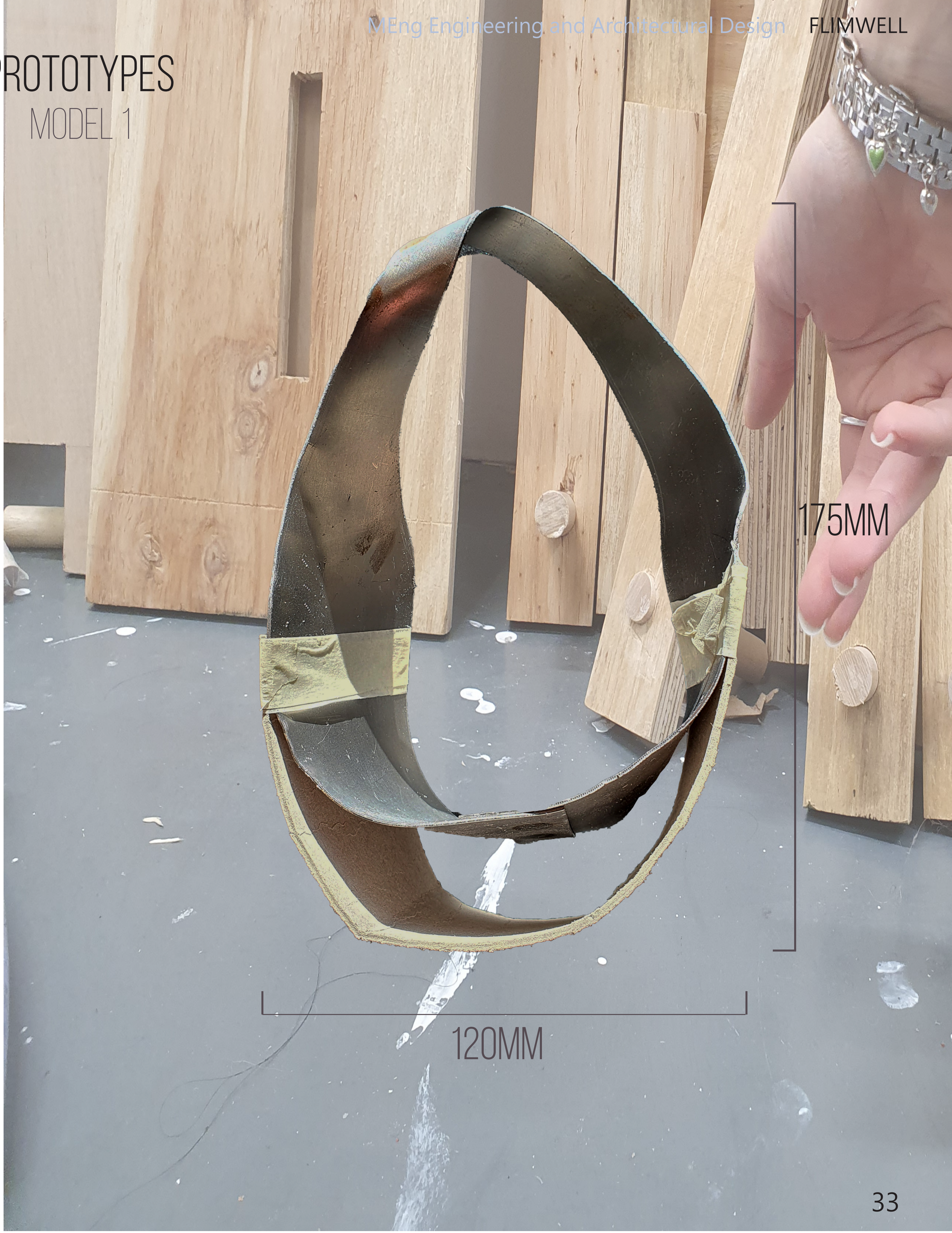
Rotate offcut to match frame curvature

Aligned holes of both offcut and frame and insert rods

PROTOTYPES
MODEL 1

The first prototype was based off of this sketch. Ideally, when scaled up, the portions of the model would allow people to sit and rock in the structure, while condensation would form at eye level. The gap between the metal and the bottom material would be filled with high-density material to act as the restoring force for the structure.

Through this protoype, it was realised that bending a bigger sheet of metal would require large amounts of force and would be very heavy to carry. It also proved difficult to find a material dense and malleable enough to fit into the gap and act as the restoring force to keep the structure upright. This model helped visualize the dimenstions of the structure, better understanding the human interaction with it.

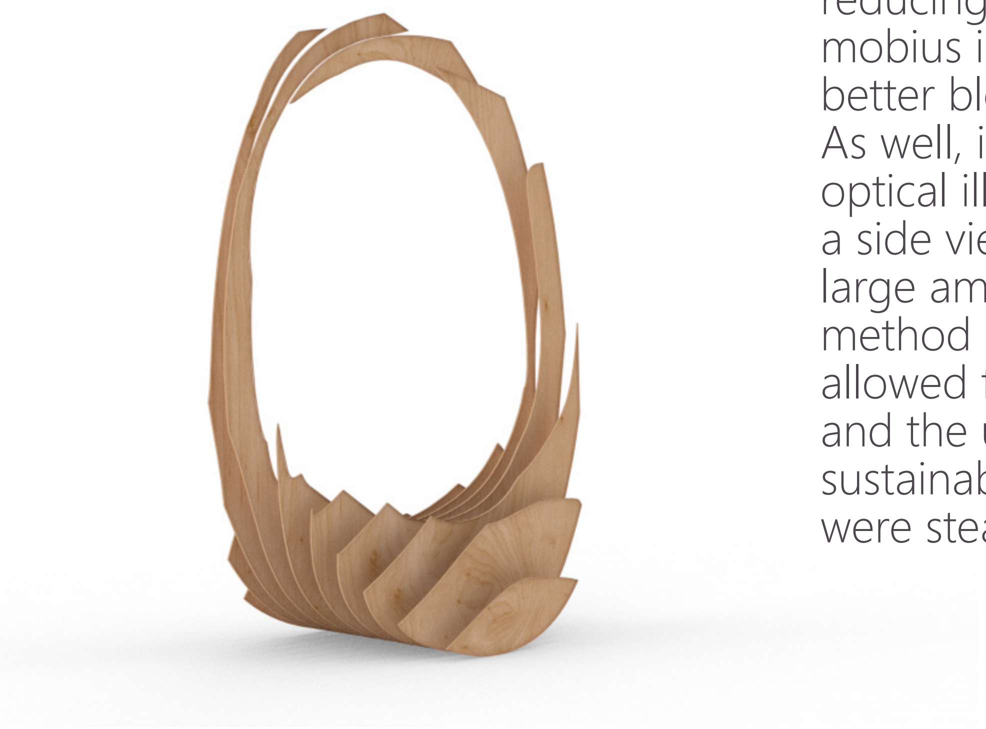


PROTOTYPES

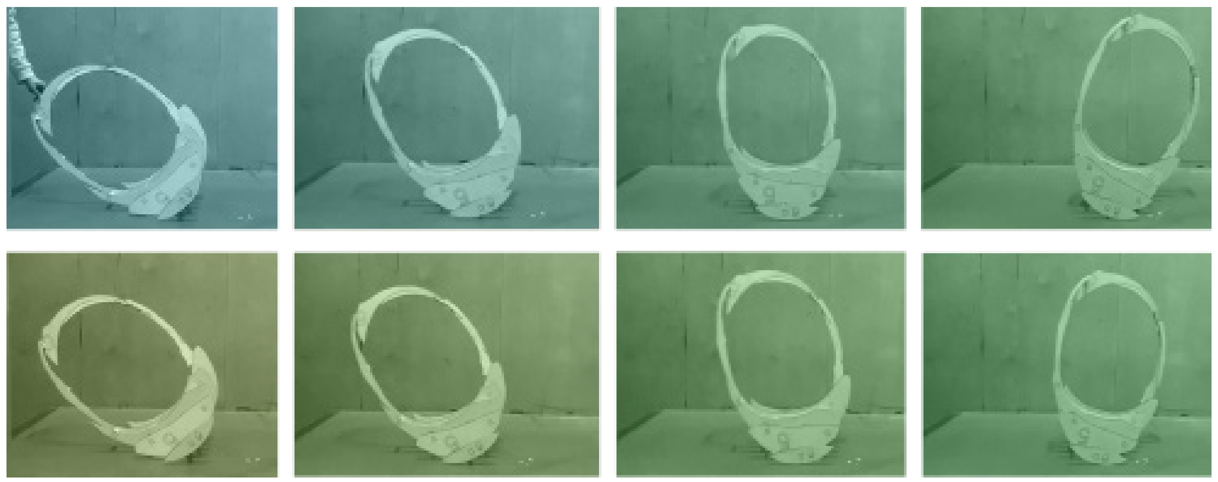
MODEL 1

Reflections created enchanting colours on the metal.

PROTOTYPES
MODEL 2



This prototype investigated a way of reducing the visual 'invasion' of the mobius in the forest, trying to make it better blend with the environvement. As well, it attempted to create an optical illusion for passerbys, where a side view of the sculpture allows a large amount of forest to traverse it. Its method of fabritcation, lazer cutting, allowed for a faster construction time and the use of cheaper and more sustainable timber compared to if it were steam-bent.



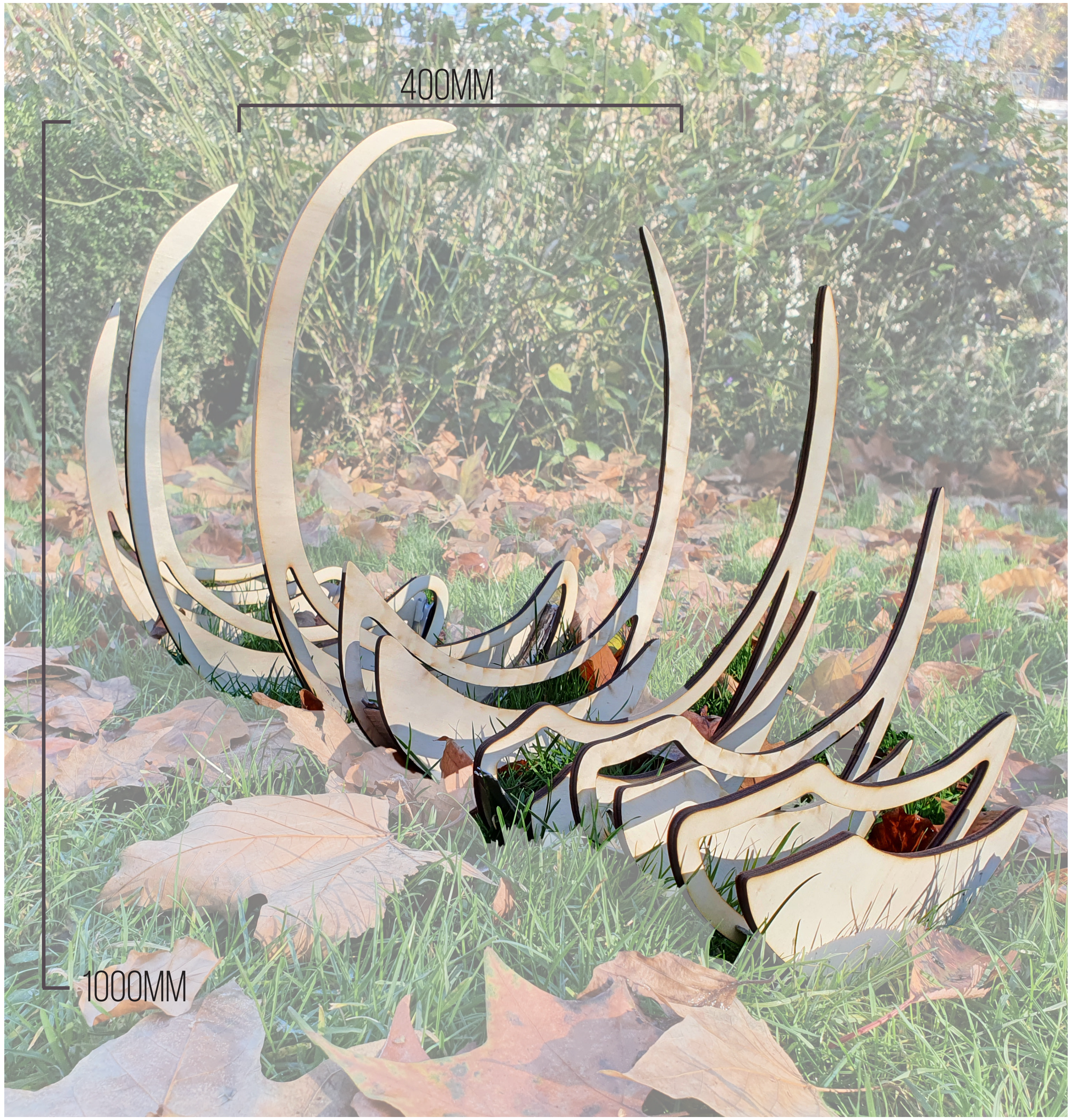
It was found that the weighting of the protoype was not equally balanced when oscillating due to the weights moving mid-oscillation. This caused the model to predominatly oscil-late leftwards. This showed the necesity to completely attach the weights needed to correct the model' s center of mass.

PROTOTYPES

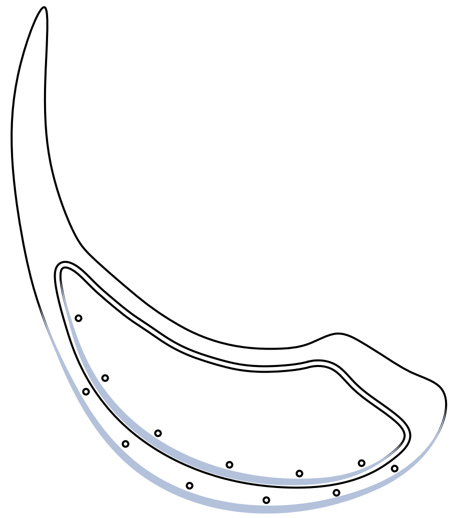
MODEL 1

The model allows the enviroment to permeate through.

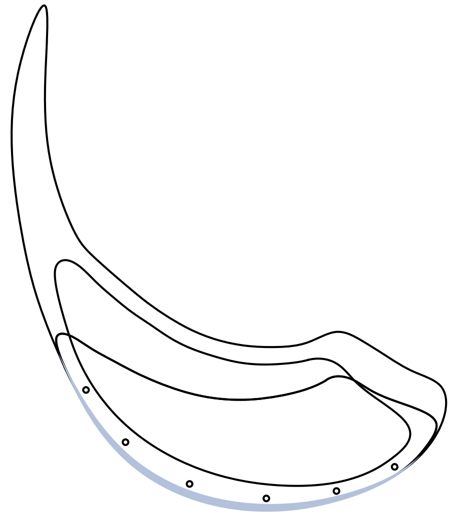
PROTOTYPES
MODEL 3



This prototype was made to test the final design idea before the CNCing. It showed that the offcut bottom curve had to match its frame bottom curve, or the movement of the frame when oscillating would not be straight. This could lead to frames colliding when in movement and was fixed in the final design.



Curves Match



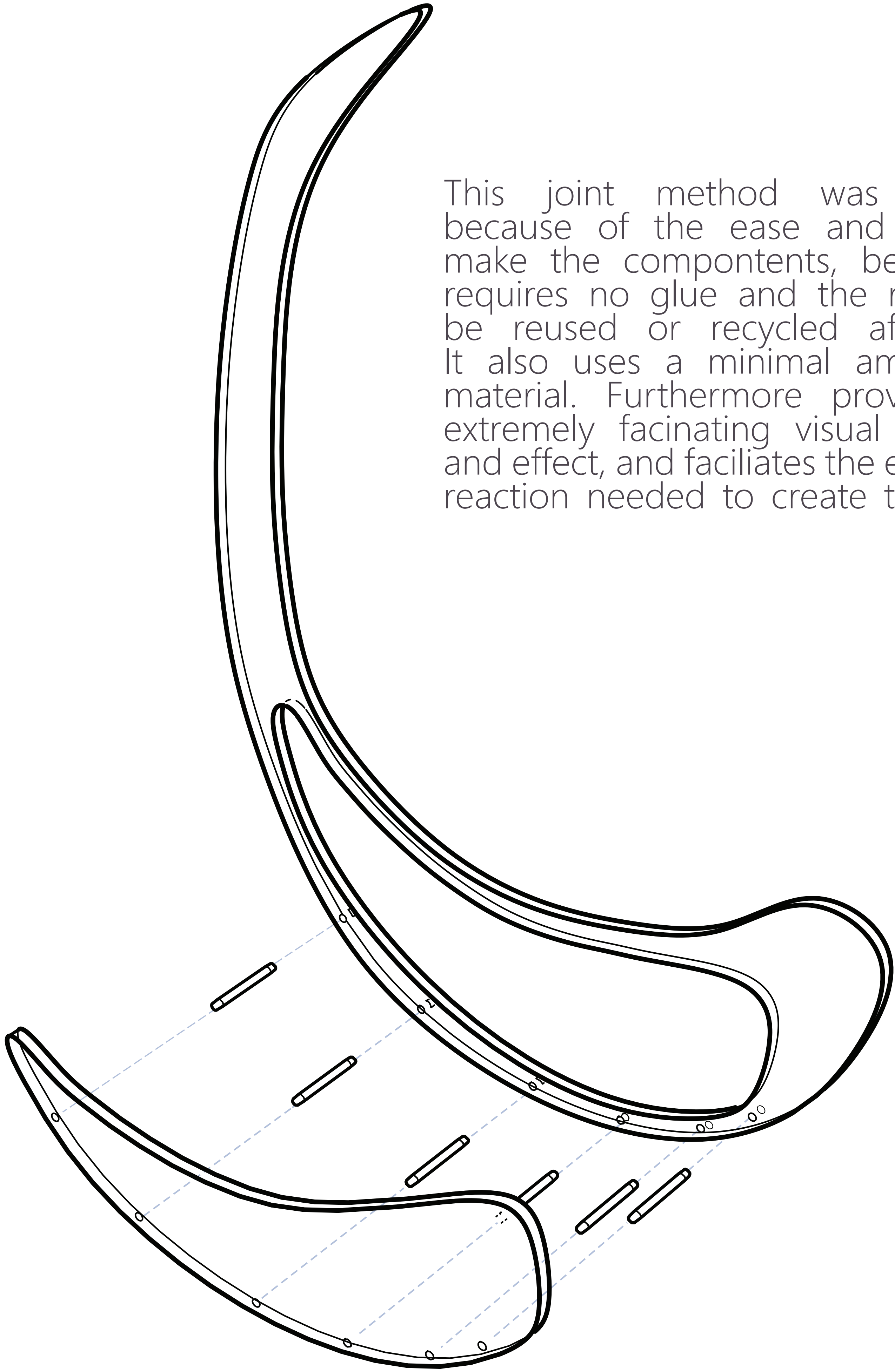
PROTOTYPES
MODEL 3 JOINTS

Rods were hammered into holes drilled into the frame with a diamter difference of 2mm. This method proved to adaquently hold the timber together as well as being easy to align, unlike the curved strip method. This joining method also gave a more interesting visual element, and was chosen for the final design.

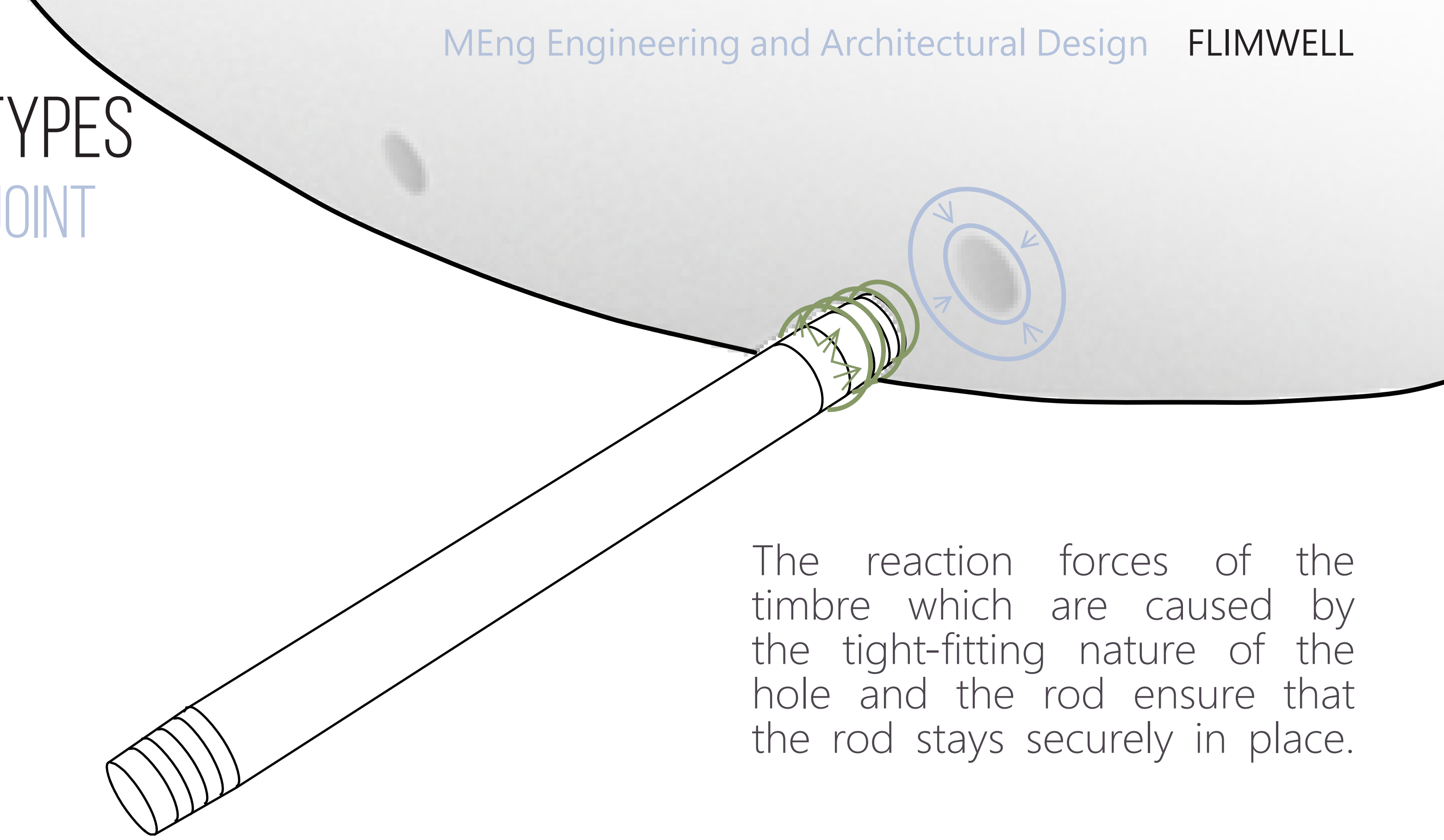
Difficulties arose with matching the shape of the metal to the groove. Hammering the strip required lots of force as the groove was the same width as the strip. This was done to ensure that the reaction forces would be enough to hold the strip without glue, however it was found that by even with 5mm difference between the strip thickness and the groove thickness could hold the strip.

Prototypes of the joints were made to test the aesthetical impact and manufacturing feasibilty of each joining method. Both methods relied on the reaction forces of the holes drilled into the frames exterted into the metal hammered into them. The first method involved hammering a series of metal rods into holes of congruent diameter, displayed in the top image. The second method involved cutting a groove the same shape of a metal sheet and again hammering it in.

PROTOTYPES
FINAL JOINT



This joint method was chosen because of the ease and cost to make the compontents, because it requires no glue and the rods can be reused or recycled after use. It also uses a minimal amount of material. Furthermore provides an extremely facinating visual element and effect, and faciliates the ebonzing reaction needed to create the stain.

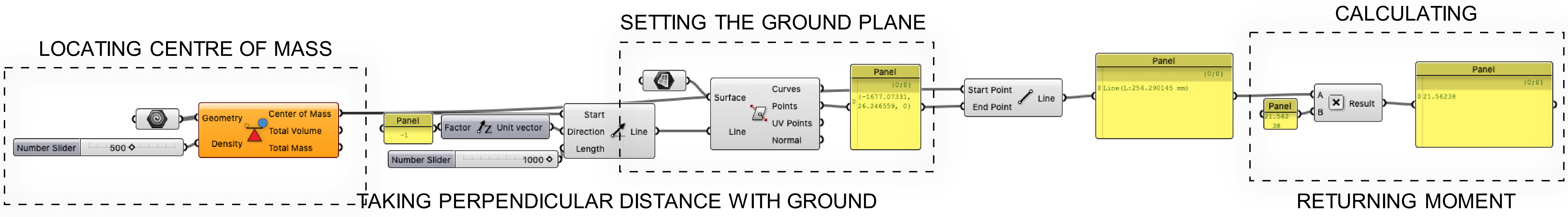


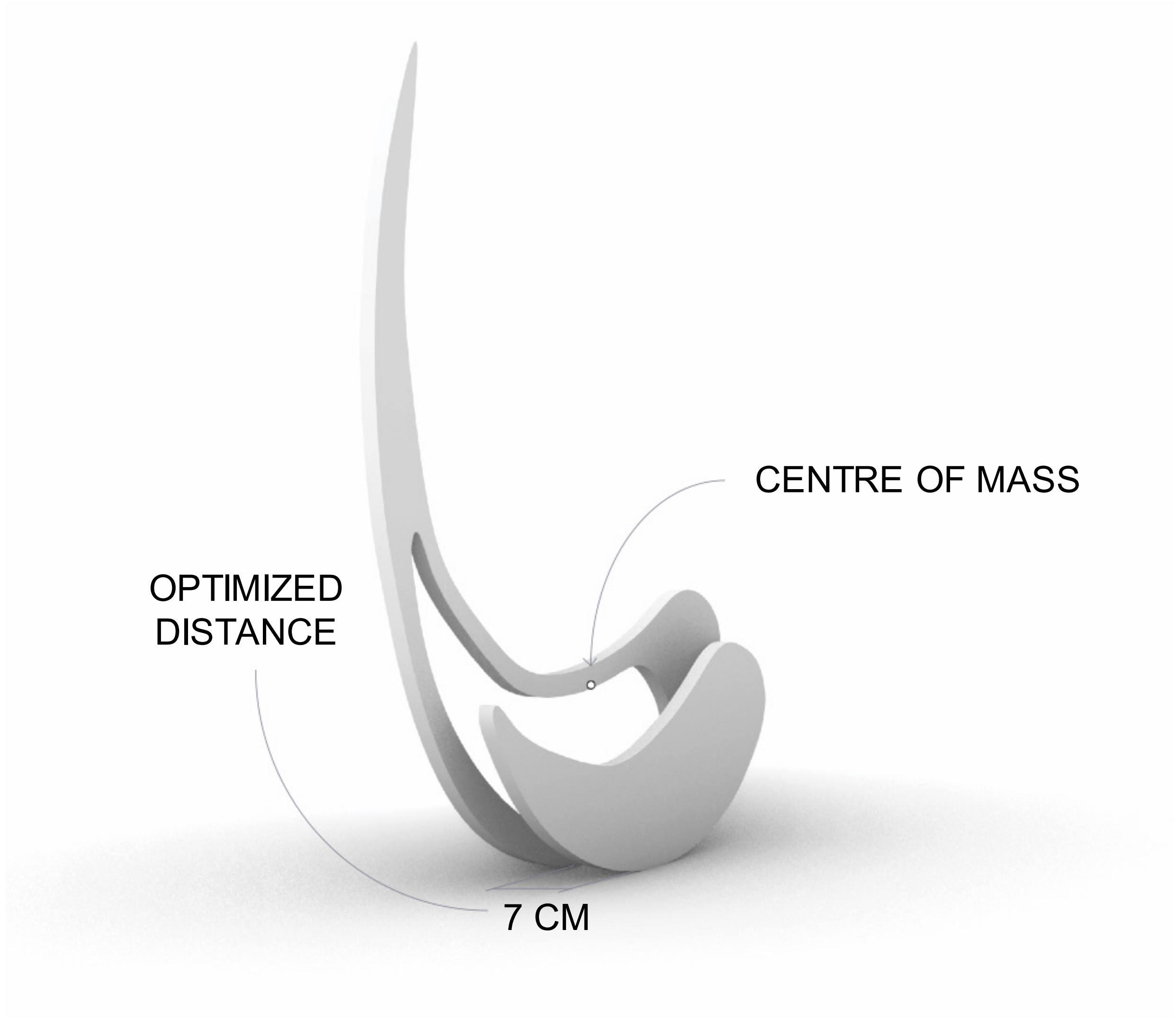
The reaction forces of the timbre which are caused by the tight-fitting nature of the hole and the rod ensure that the rod stays securely in place.

When hammering the rods, a soft resistive surface placed underneath the frames. Due to the surface's softness, the rods caused the plywood to chip and some pertruded fro the hole.

STRUCTURAL CALCULATIONS

CENTRE OF MASS





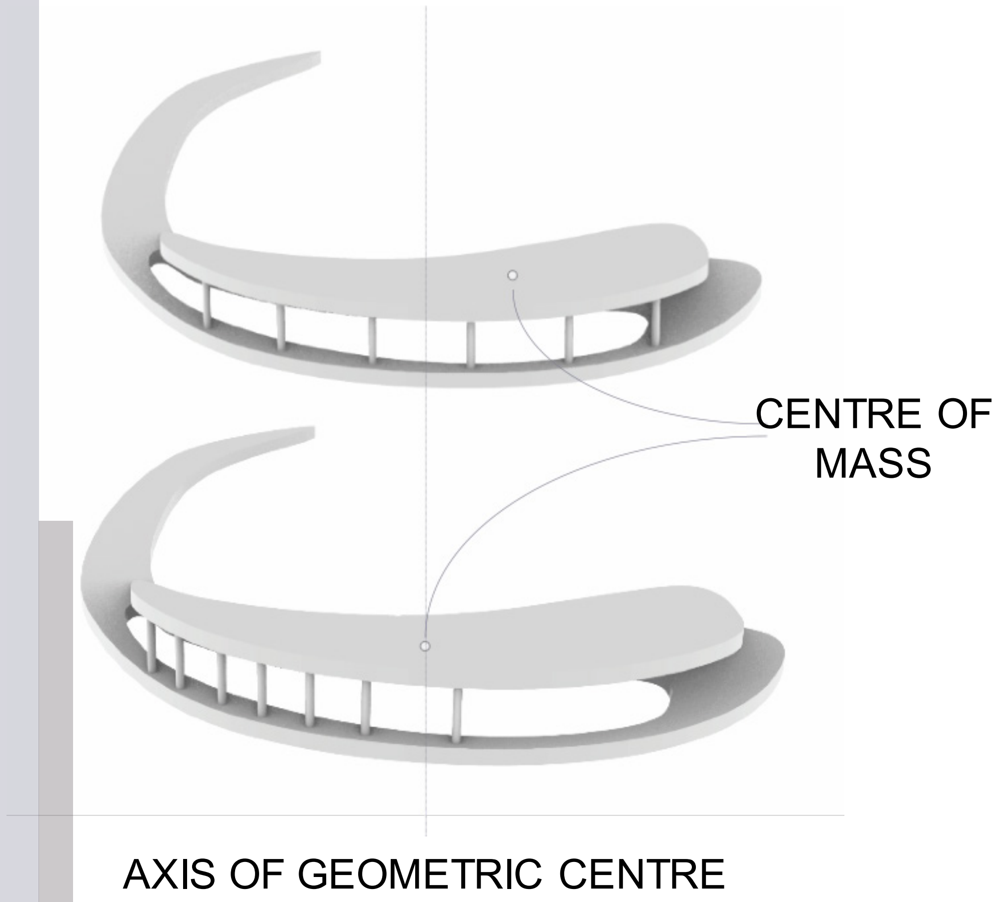
OPTIMIZING THE LATERAL DISTANCE BETWEEN THE FRAM AND OFFCUTS

The grasshopper code locates the position of the centre of mass off each frame - offcut combination. The distance between the frame and the offcut were adjusted so as to obtain the centre of mass in the geometric centre between these two pieces to enhance stability.

This distance was calculated to be 7 cm as shown in the image alongside

STRUCTURAL CALCULATIONS

CENTRE OF MASS



The rods were initially equally distributed.

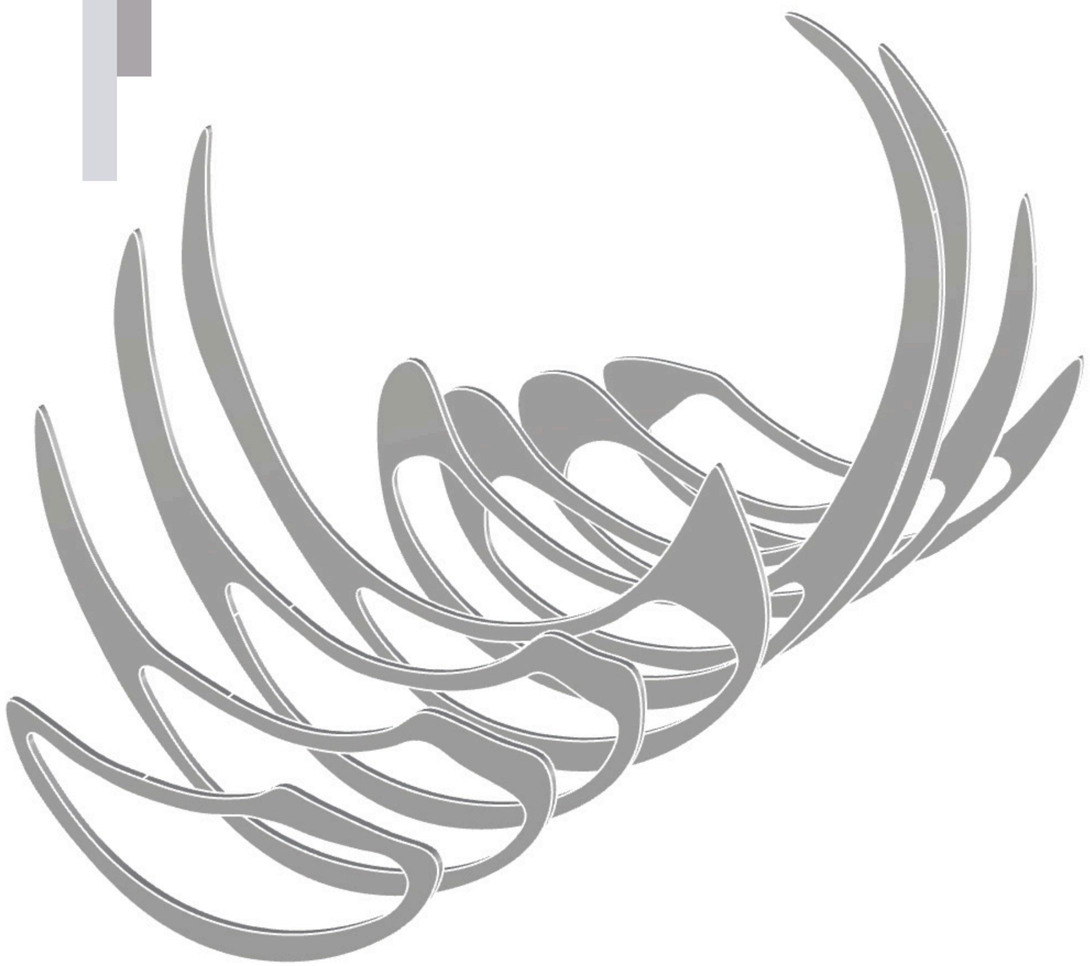
The centre of mass was calculated.

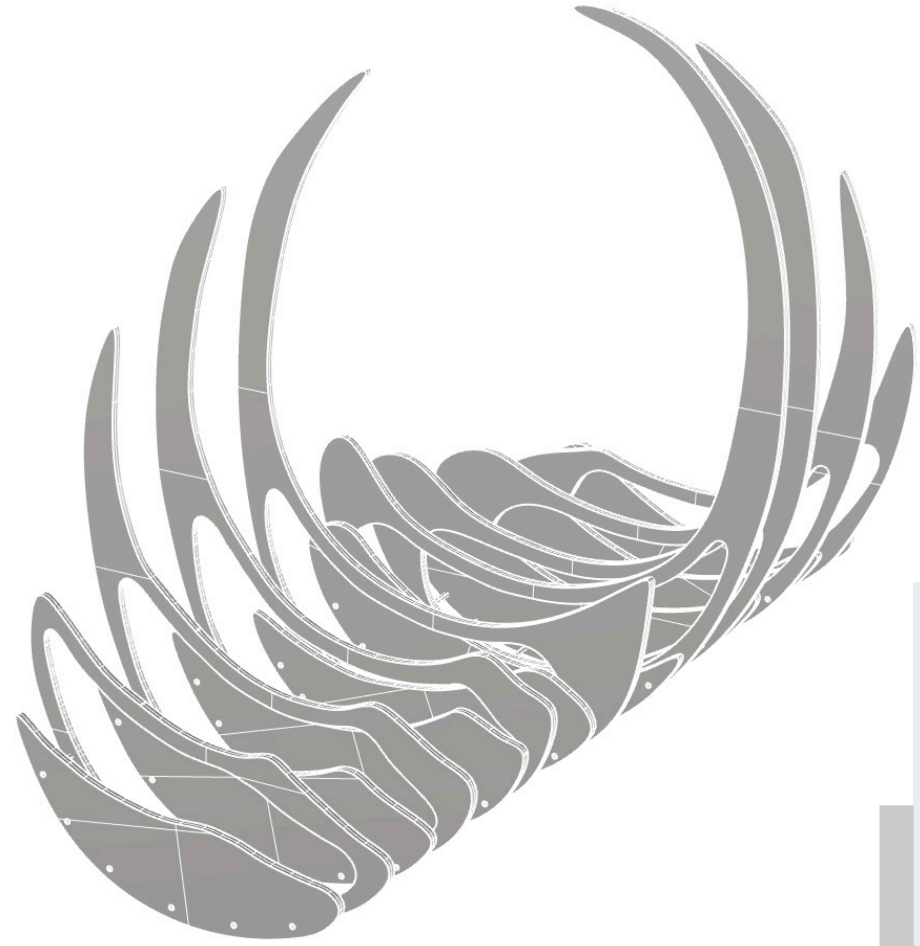
The rods were added and removed per piece in order to obtain the centre of mass in the geometric centre.

The initial pieces were expected to be oriented like this.

This doesn't fulfil the visual requirement of the structure.

Also, without the offcuts added this lacks lateral stability. Most pieces do not have a low enough centre of mass to restore the force.





The final pieces were expected to be oriented like this.

This fulfils the visual requirement of the structure.

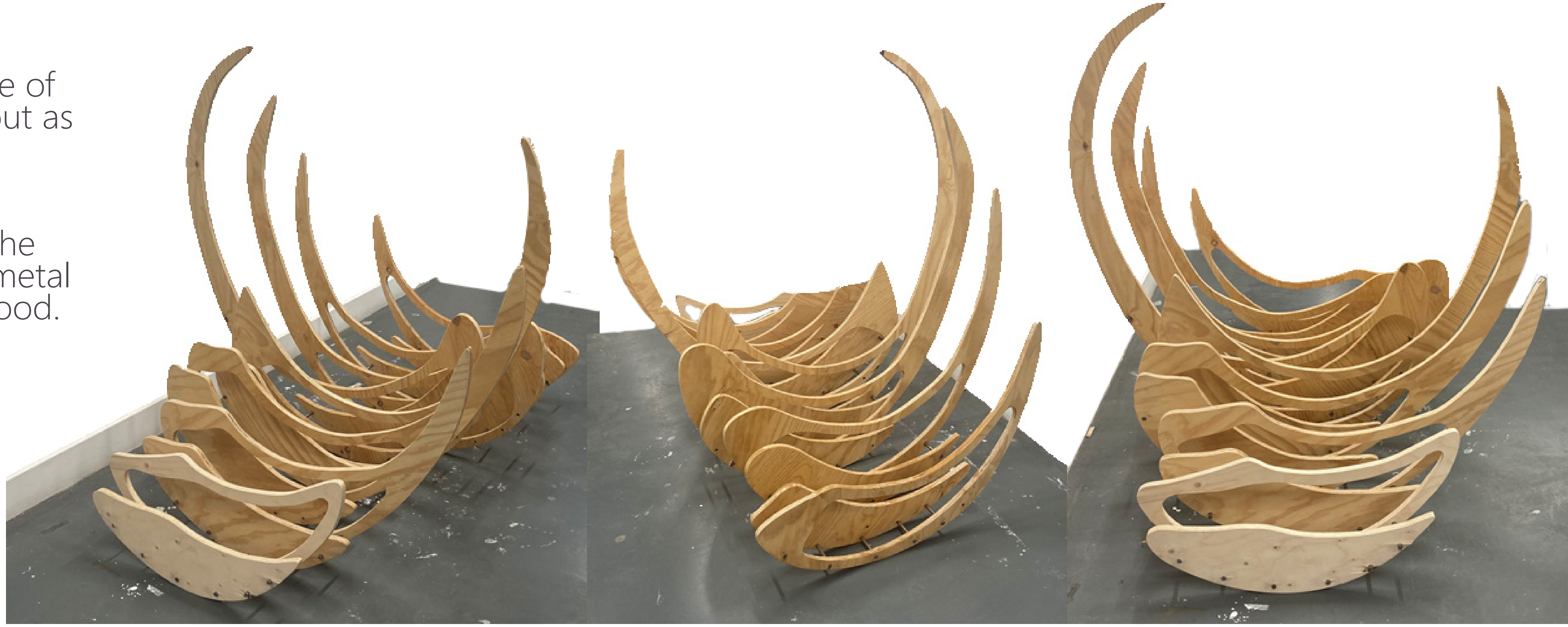
The offcuts and the rods add to the lateral stability of the structure. Also, the centre of mass is lowered and when the piece is displaced it will swing back the the initial position

STRUCTURAL CALCULATIONS

CENTRE OF MASS

The model based on the centre of mass calculations did not turn out as expected.

The code didn't account for the varying densities of wood and metal and took only the density of wood.



CALCULATING THE VOLUME OF METAL TO EQUAL THE WEIGTH OF WOOD

Calculating Mass of 1 Rod

Density of Steel $= 8000\,kg/m^3$

Length of Each Rod $= 7cm = 0.07m$

Area of cross section $= \frac{\pi}{4}(10)^2 mm^2 = 78.5 mm^2$
$= 78.5 \times 10^{-3} m^2$

mass of 1 rod = Density × Volume
$= 8000 \times 0.07 \times 78.5 \times 10^{-3}$
$= 0.4396\,kg$

Density of wood $= 500\,kg/m^3$

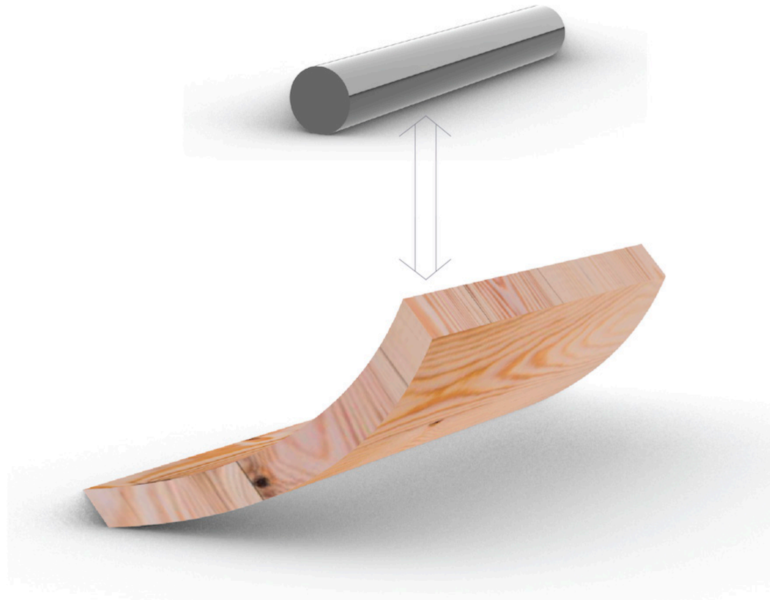
Length of wood $= 7cm = 0.07m$

Thickness of wood = Thickness of frame $\approx 2.5cm = 0.025m$

Mass of wood $= 0.4396 \times n\ kg$

where n = no. of rods per piece

$$\text{Width} = \frac{0.4396 \times n}{500 \times 0.07 \times 0.025}\ m$$



PIECE INDEX	1	2	3	4	5	6	7	8
RODS (n)	5	6	6	6	5	7	6	6
WIDTH	2.512 m	3.014 m	3.014 m	3.014 m	2.512 m	3.5168 m	3.014 m	3.014 m

STRUCTURAL CALCULATIONS

CENTRE OF MASS ADJUSTEMENT FABRICATION

Difference in current mass and required mass was calculated.

This difference was added to each piece using metals disks

Knowing the density and cross section of metal, the required mass was achieved by changing the thickness

The weights were welded onto the rods.

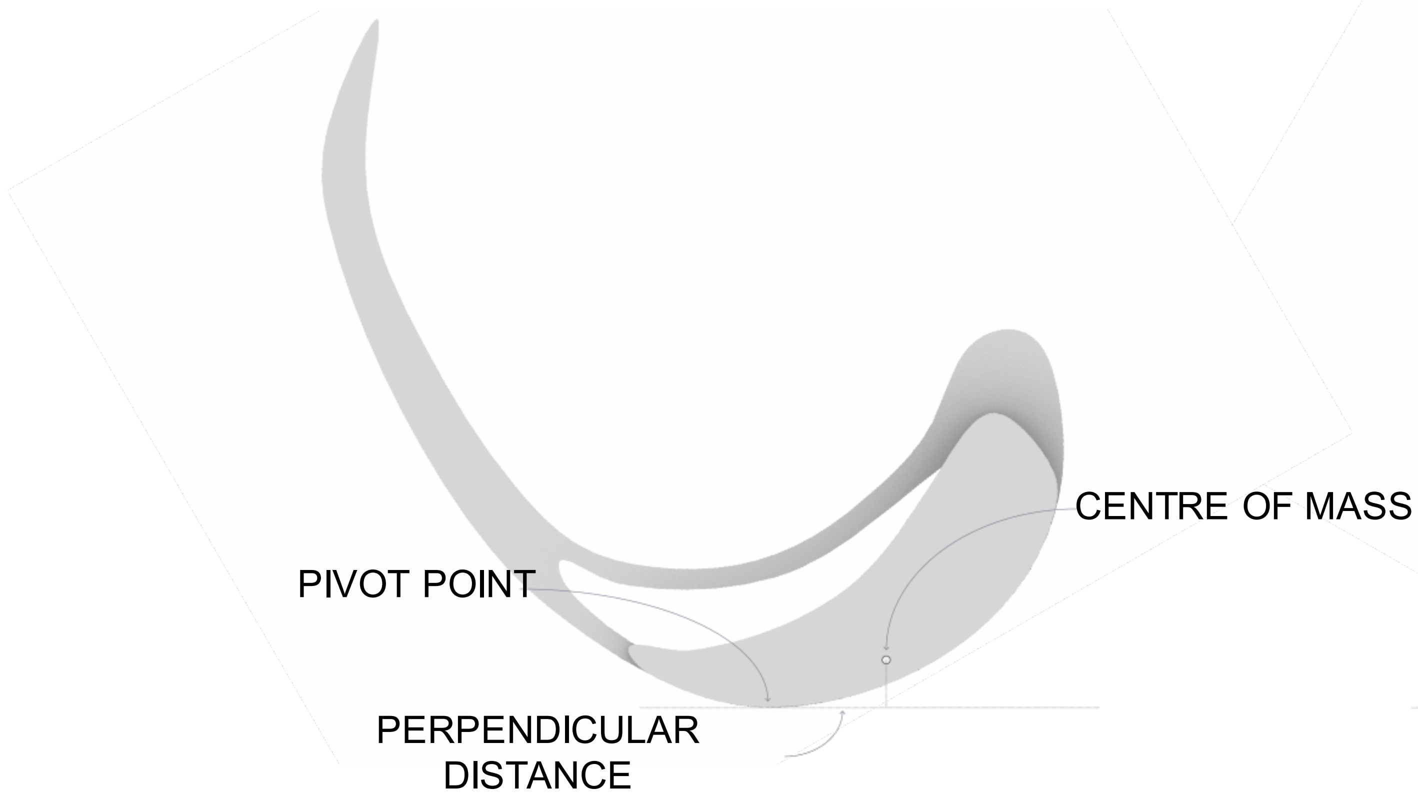
STRUCTURAL CALCULATIONS

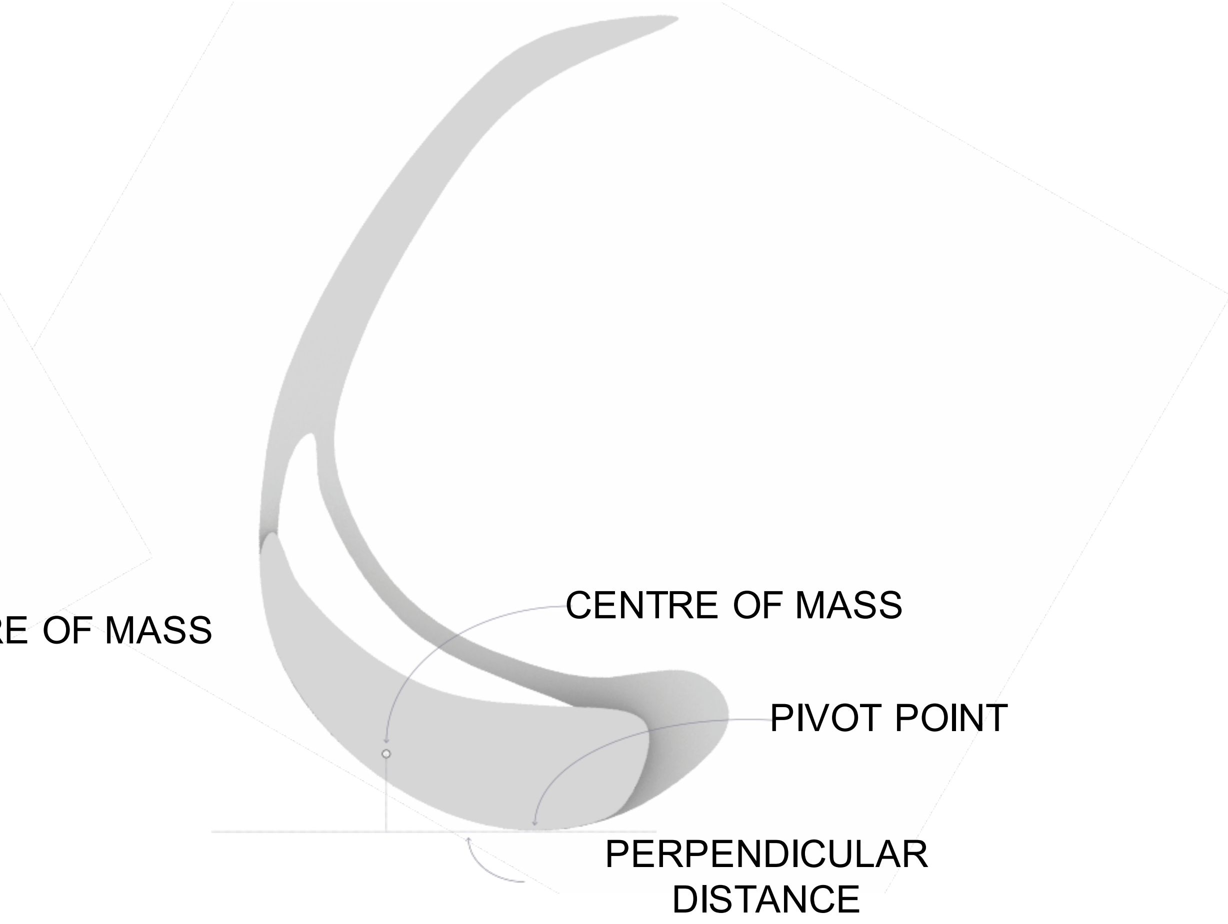
CENTRE OF MASS ADJUSTEMENT BEFORE & AFTER

STRUCTURAL CALCULATIONS

RETURNING MOMENT

Moment of returning = Perpendicular Distance × Weight at Centre of Mass





HUMAN INTERACTION
VESTIBULAR SYSTEM STIMULATION

The vestibular system is how the brain senses spatial awareness, measuring where our body is in relation to gravity (proprioception) and how it is moving (kinesthesia). Stimulating it is extremely important for healthy brain functioning, which is usually achieved by changing the body' s balance.

Our structure is able to provide vestibular stimulation by its human interactions, When people are able to play with it, leaning down or by unbalancing themselves to exert force on the frames, the vestibular system is engaged. This is also partly why, during the installation, many of the visitors decided to play around with the structure.

HUMAN INTERACTION
VESTIBULAR SYSTEM STIMULATION

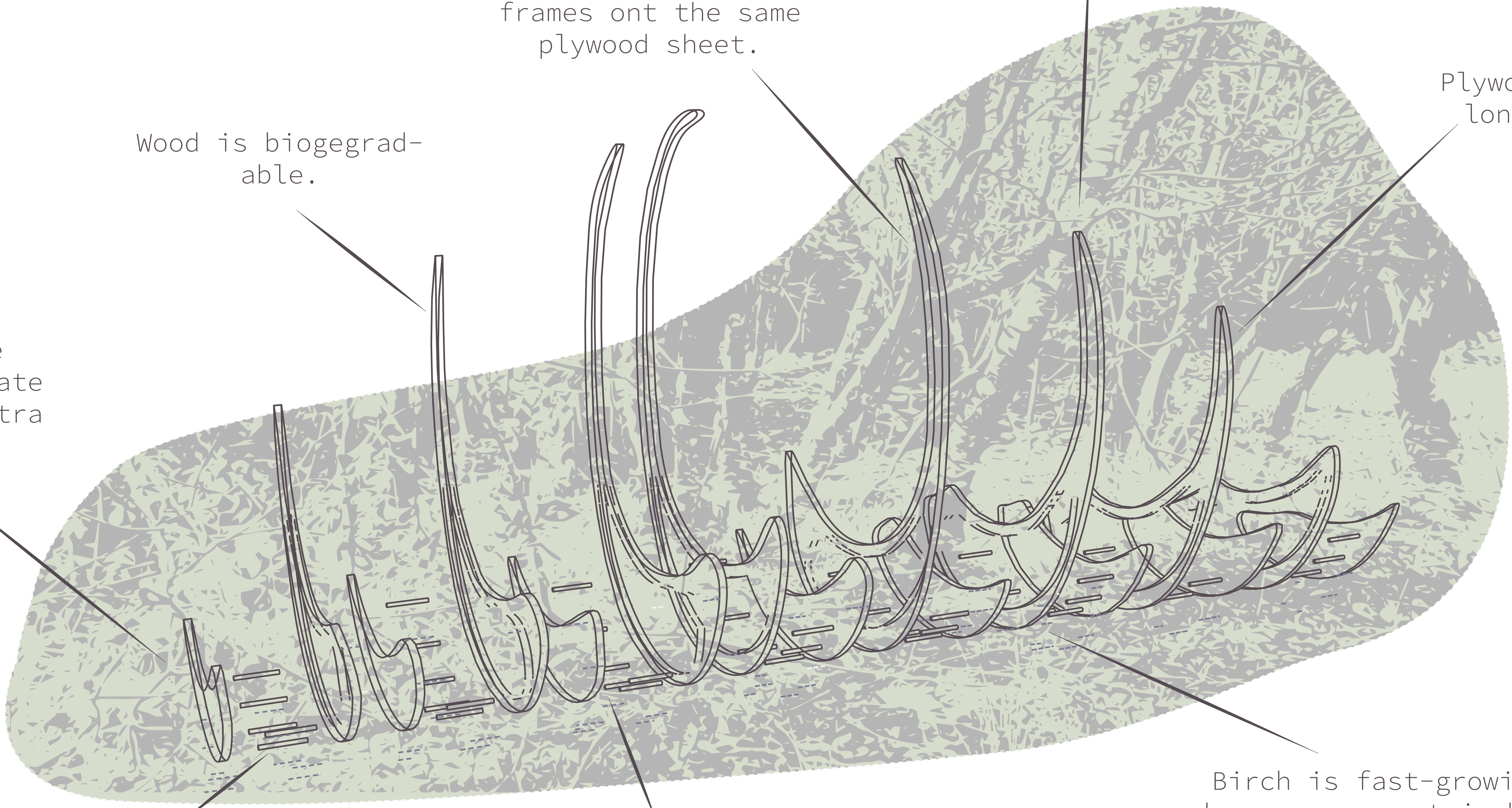


THE JOURNEY
STRUCTURAL ITERATIONS






SUSTAINABILITY
ELEMENTS




ELSA IN FILMWELL

ELSA IN FILMWELL

ELSA IN FILMWELL

CRITICAL ANALYSIS

THE VISUAL FEATURE

The colours and materiality chosen for the structure were to keep it in sync with the forest environment. This is a feature that was successfully achieved. The structure seemed to be a part of the forest environment. The warm brown of the wood painted with tea was a perfect combination with the autumn leaves strewn over the forest floor. The aim of the structure was to block as little of the forest view as possible which it did. It further presented to be a perfect camouflage in the forest environment when seen from a distance.

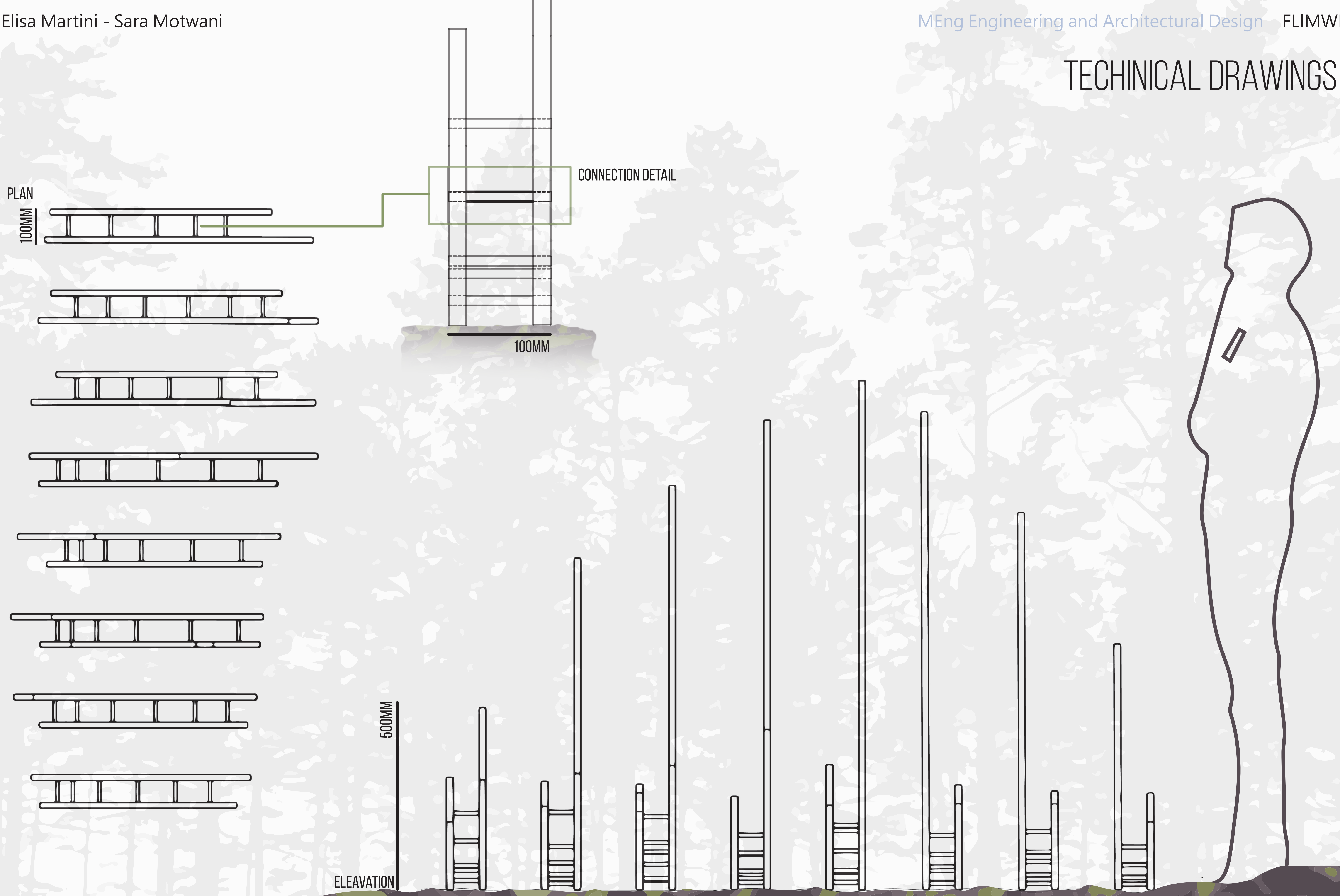
THE STRUCTRAL FEATURE

The oscillations of the frames has been expected to be damped on the forest floor as compared to the smooth floor surface it was tested on prior to installation. However, the extent of damping on the forest floor was extremely high. Each piece stopped after just half a cycle. Also, due to the undulating nature of the forest floor, the lateraling stability of the structure was compromised. When a piece was displaced by a large angle, it tended to lose balance and tip over, consequently making all the adjacent pieces fall as well. These problems were realised in the initial phase of the installation. In order to solve these problems, the forest floor under the structure was made frictionless and even. This was done by bringing the clay from near to pond and applying it to the surface to make it as flat as possible. Once the surface was made flat, the lateral stability largely improved and the damping was such to allow about 2-3 complete oscillations per piece when displaced.

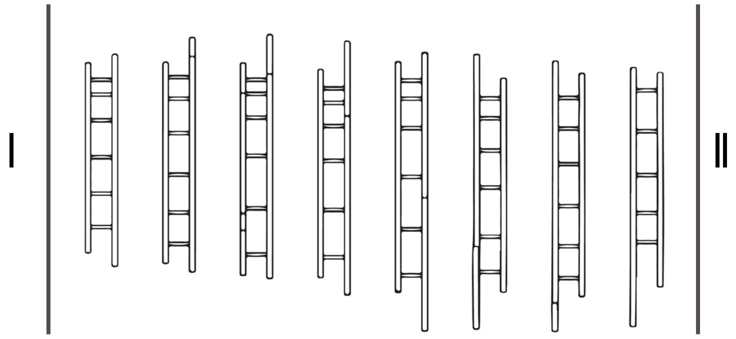
THE ENVIRONMENTAL FEATURE

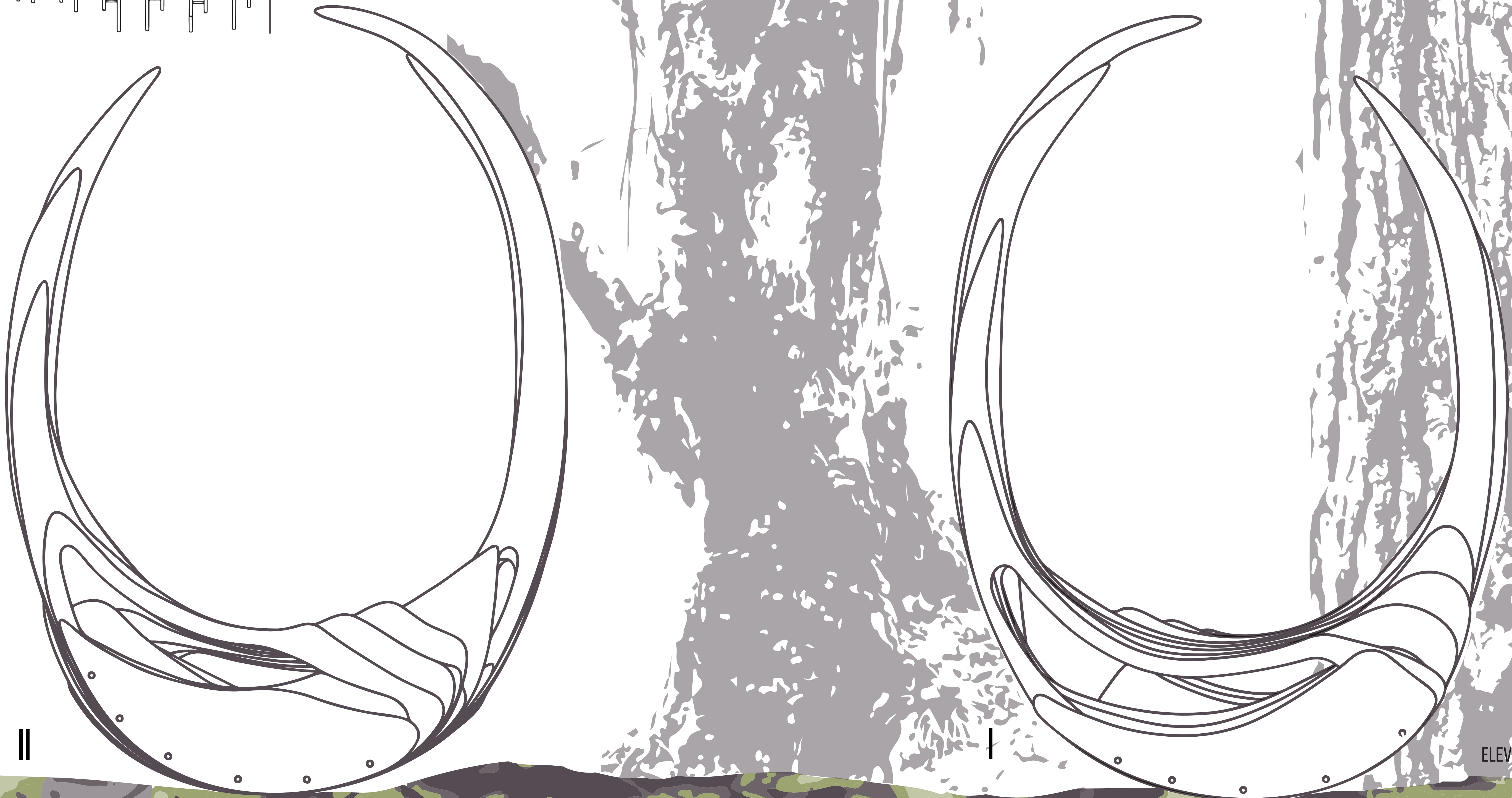
The staining of the wood was extremely successful. After just a few hours in the forest, the black stain of iron acetate had started to spread little. The drops of condensation were evident on the metal rods. However, when left overnight, it became unclear to be able to observe the effect of condensation on the structure as it began to rain. It was observed in the morning that the rods has already started to show signs of initial rusting.

TECHINICAL DRAWINGS



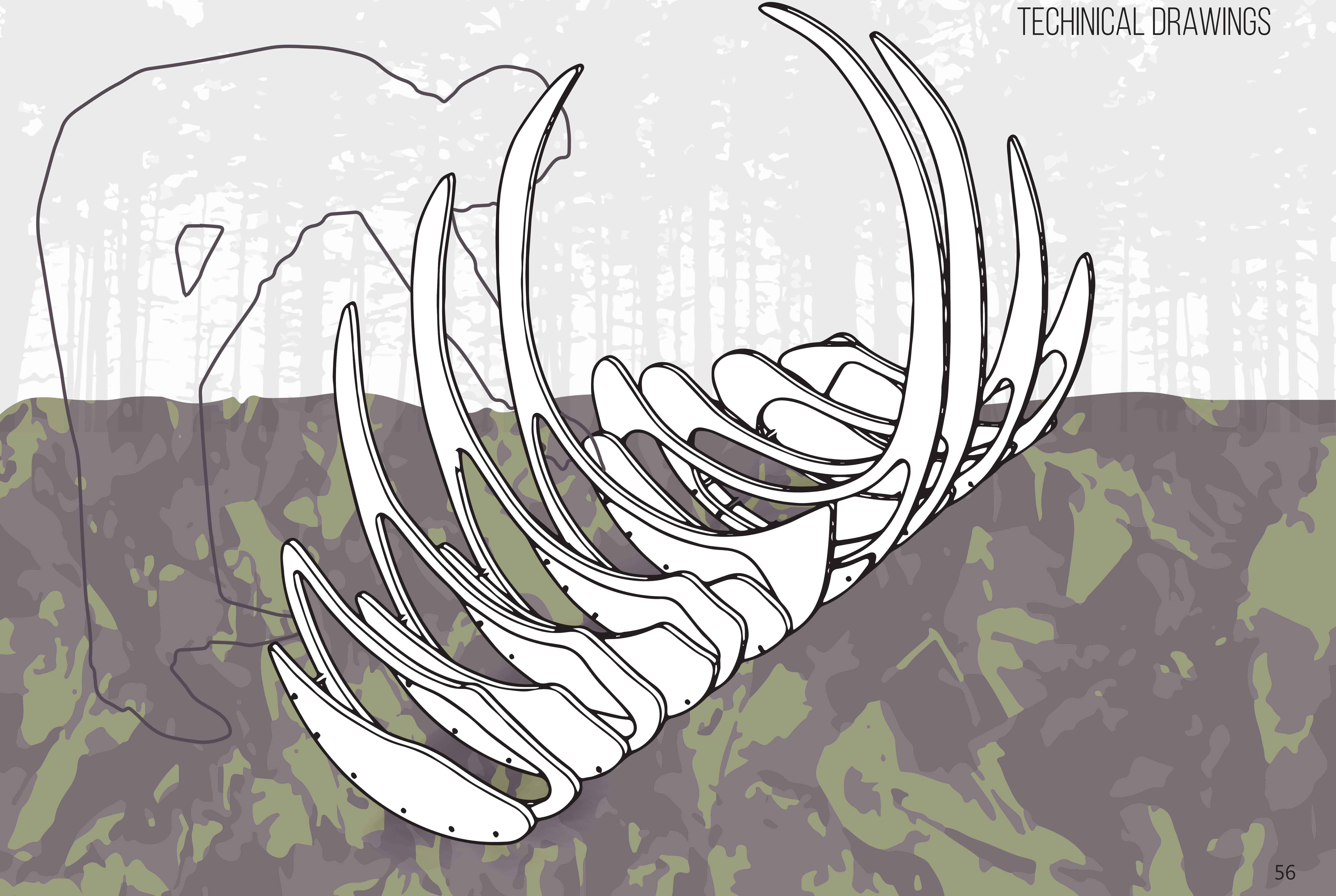
TECHINICAL DRAWINGS





ELEVATIONS

TECHINICAL DRAWINGS



FRAME LIBRARY